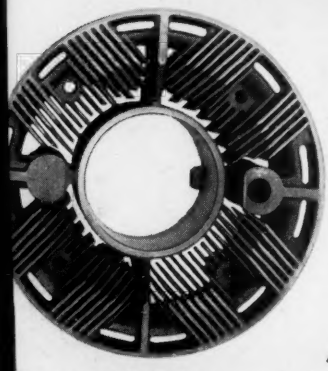
WIRE AND WIRE PRODUCTS

DECEMBER 1944



Fin-type block
(patented)

MORGAN WIRE
DRAWING MACHINERY

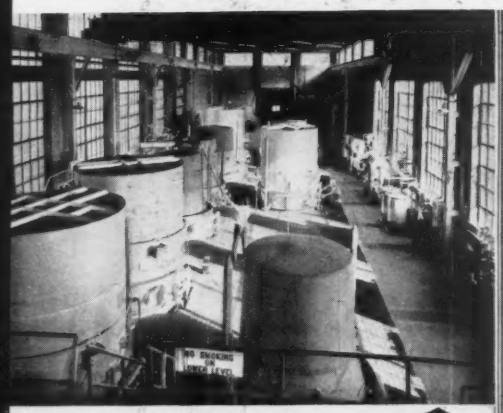
PLAN NOW WITH MORGAN

MORGAN CONSTRUCTION CO. • WORCESTER, MASS.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

WILSON WIRE ANNEALING *Furnaces*

The standard Lee Wilson bell type furnace with vertical radiant tube heat application still offers the most uniform temperature distribution, the most uniform annealing with the lowest production and maintenance costs.



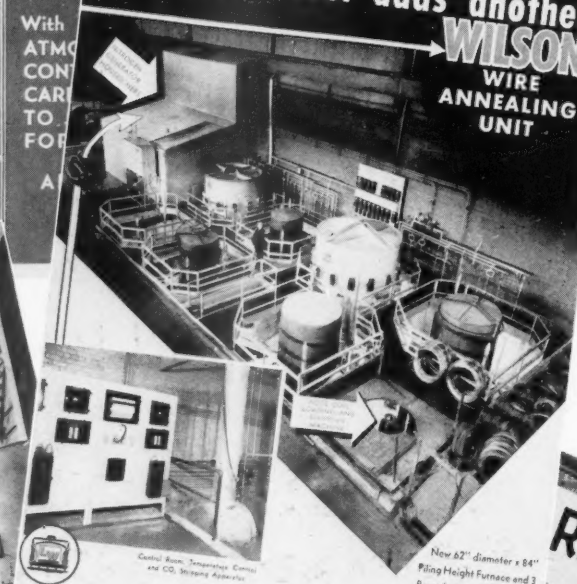
WIRE ANNEALING at its Best

ATLANTIC WIRE Co. Branford

With ATMO CONT CARB TO FOR A

COMPLETELY DESIGNED and ENGINEERED BY Lee Wilson ENGINEERING Co., Inc. 20005 West Lake Road CLEVELAND, OHIO Telephone ACademy 4670

Sheffield Steel adds another WILSON WIRE ANNEALING UNIT



Control Room, Temperature Control and CO, Stripping Apparatus

New 62" diameter x 84" Piling Height Furnace and 3 Bases in foreground, at the Kansas City, Mo., plant.

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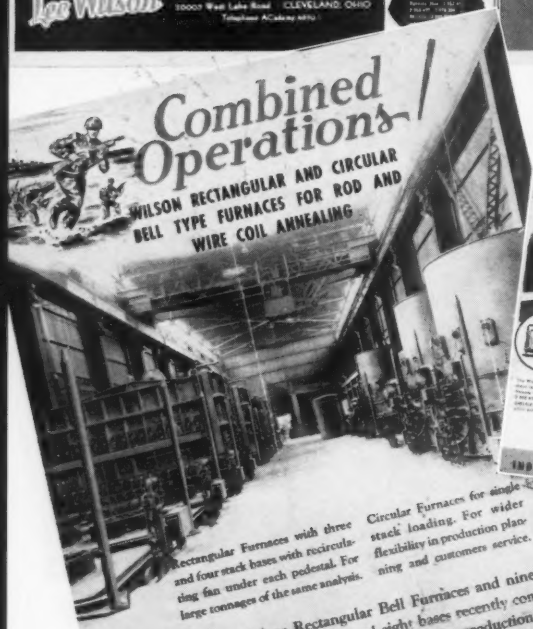
INDUSTRIAL FURNACES • RADIANT TUBE HEATING • HEAT TREATING PROCESSES

Combined Operations

WILSON RECTANGULAR AND CIRCULAR BELL TYPE FURNACES FOR ROD AND WIRE COIL ANNEALING



Rectangular Furnaces with three and four stack bases with recirculating fan under each pedestal. For large tonnages of the same analysis.

Circular Furnaces for single stack loading. For wider flexibility in production planning and customers service.

This installation of four Rectangular Bell Furnaces and nine bases and three Circular Bell Furnaces and eight bases recently completed at one of the newest large wire mills enables the production department to utilize the best advantages of both types.

Engineered and Constructed by LEE WILSON ENGINEERING Company

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INDUSTRIAL FURNACES • RADIANT TUBE HEATING • HEAT TREATING

ROD COIL Spheroidizing

BULLET CORE

No. 4037
2330
8644
52100

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The Wilson Annealing Unit is covered by Patents Nos. 1,952,402, 2,068,477, 2,078,356, 2,081,612, 2,089,843, and other patents pending.

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Lee Wilson ENGINEERING Co., Inc.

20005 West Lake Road CLEVELAND, OHIO

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INDUSTRIAL FURNACES • RADIANT TUBE HEATING • HEAT TREATING PROCESSES

Help your Die Room to top speed, top economy in getting Shape Dies out and on the job! Plan your shape die purchases for minimum finishing time by specifying . . .

1. Standard squares and hexagons, rough-shaped to within a few thousandths of size, stocked in sizes up through 1⅝" square, and 1⅞" hex. for immediate delivery!

2. Rough-shaped "specials" for large special shapes—delivered ready for quick finishing to shape and size desired.

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Many leading mills are now finishing all three types on exclusive Carboloy-developed Finishing and Servicing Equipment. Easy, fast, economical! Complete training at our Detroit plant—available to your Die Room personnel without charge. Your local Carboloy Die Specialist will gladly furnish full details.

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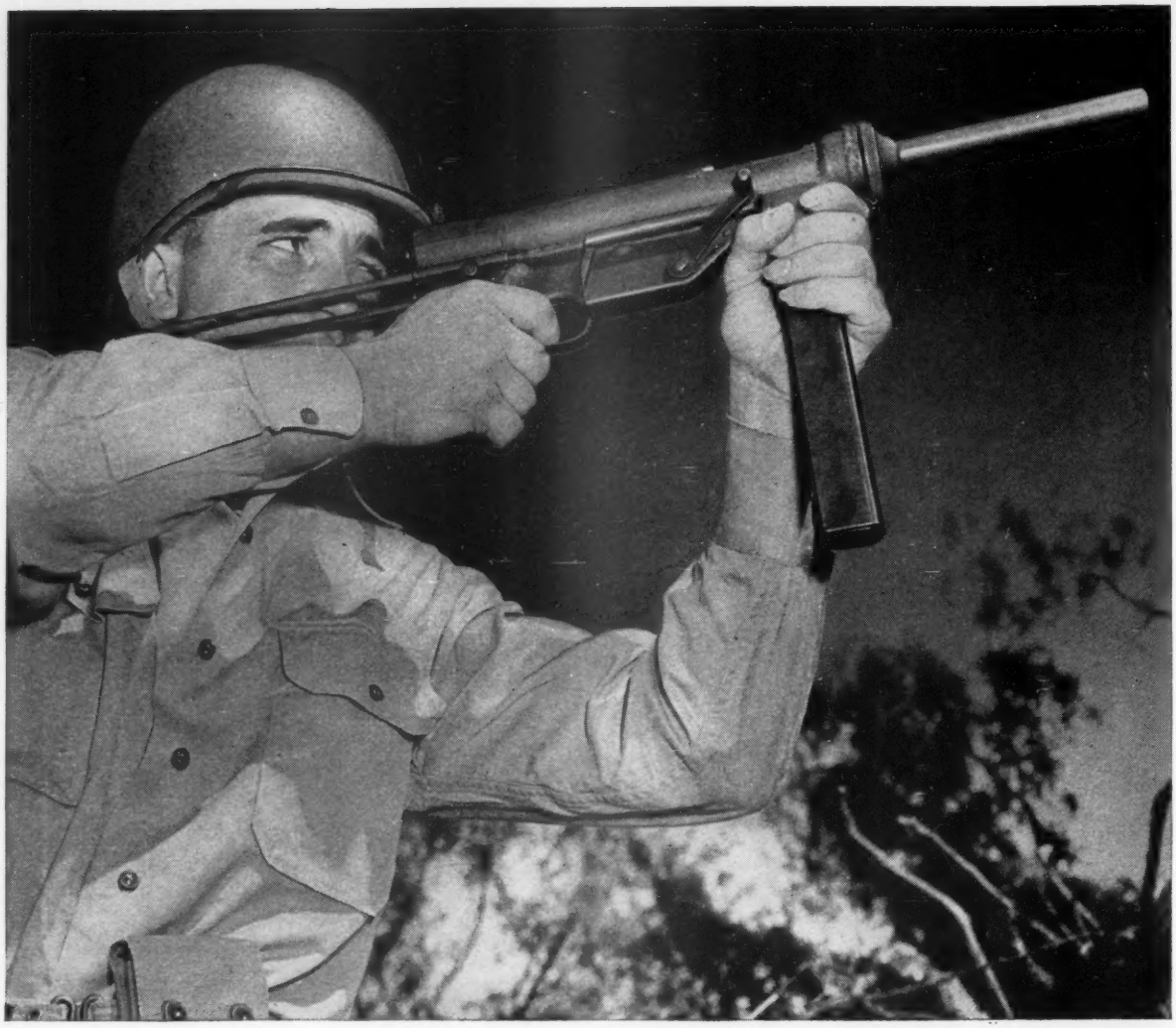
Authorized Distributors: Hartley Wire Die Co., Thomaston, Conn.; Michigan Wire Die Co., Detroit, Michigan

TRADEMARK

CARBOLOY TRADEMARK **SHAPE DIES**



A spring fires it

Army rifles, pistols, machine guns, depend upon steel springs to snap the firing pins when the trigger is pressed. Failure of a small spring at a crucial moment could mean trouble.

Just about every kind of spring imaginable is being made from Bethlehem spring wire or from spring wire drawn from Bethlehem rods. Springs for the mechanisms of Army guns; springs for airplanes; springs for beds aboard hospital ships and in recuperation centers; springs for seat cushions in Army trucks and combat vehicles; springs for scores of other essential tasks.

Large tonnages of spring wire, and of rods to be drawn into spring wire, are continually being turned out by Bethlehem wire mills for duty on distant fighting fronts and in war-related uses at home.

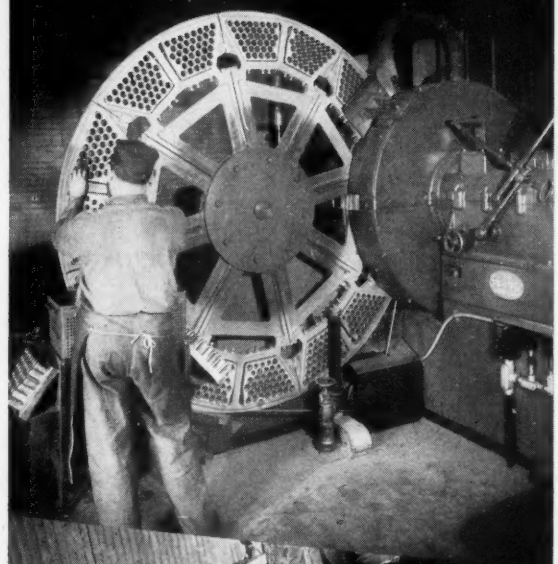
BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

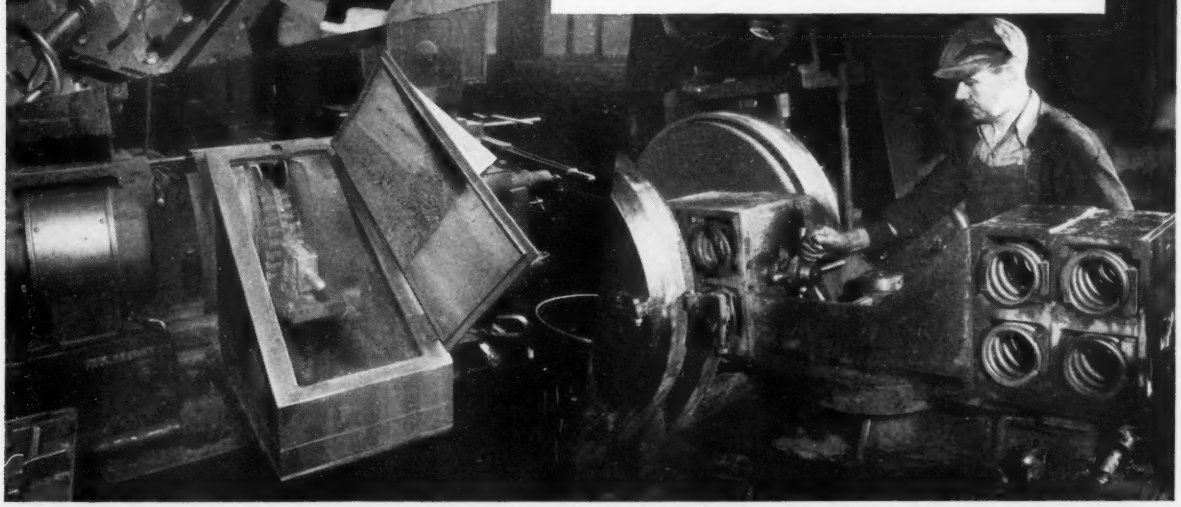
BETHLEHEM STEEL

Bethlehem Steel Export Corporation, New York City

Wire & Wire Products, Vol. 19, No. 12, December 1944, Executive Office 300 Main St., Stamford, Conn. Published by the Quinn-Brown Publishing Corporation, Richard E. Brown, President; R. S. Spengel, Secretary and Treasurer. Publication Office, 13 West Church Street, Washington, N. J. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50c cents per copy; Foreign, $7.50 per year. Entered as second class mail at the Post Office, Washington, N. J., under Act of March, 1879.

NORTON DISCS . . .
for every Spring Grinding Job





Solid and Segmental Types

Plate and Inserted Nut Mountings

Alundum, 19 Alundum, 38 Alundum and Crystolon Abrasives

Vitrified, Silicate, Resinoid and Shellac Bonds

A Wide Variety of Grains, Grades and Structures

If you are using discs or have a surfacing operation where discs can be used, Norton abrasive engineers will be glad to study your jobs and specify for each the disc that will assure maximum production.

The Norton line of disc wheels is completely described in the booklet "Disc Grinding — A Production Operation". Write for a copy. Just ask for Form 1141-WP.

NORTON COMPANY
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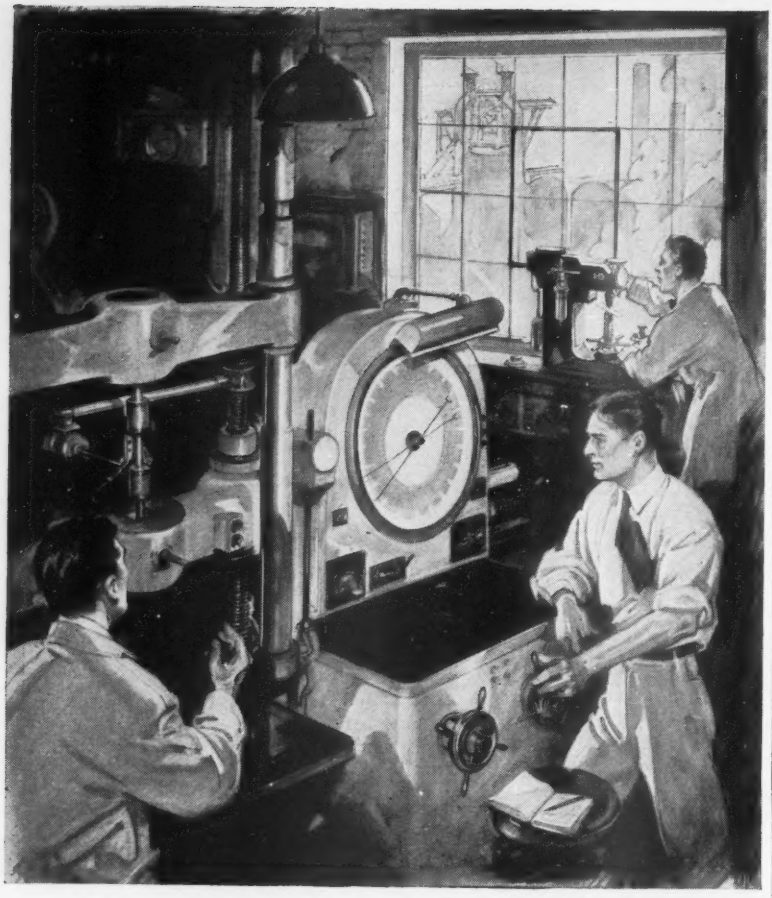
NORTON ABRASIVES



RESEARCH TESTS STEELS FOR PEACE IN THE CRUCIBLE OF WAR

In the train of vast tonnages and varieties of steel being produced in America for war, new and better steels for peace-time use will follow.

Because of the knowledge and experience gained through steel research and metallurgical development during the peaceful years, the steel industry was ready for war. It was prepared to produce quality steels quickly in overwhelming tonnages to help win the battle of supply and arm our forces with superior weapons and equipment.

The accelerated testing of steel in the crucible of war has enabled metallurgy and research to develop many tougher, better, more versatile steels that will open new avenues for enterprise and employment when peace comes.

JONES & LAUGHLIN STEEL CORPORATION J&L STEEL

PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR

METALLURGY IN ACTION

How far will steel stretch and what "pull" can it take before it breaks in two, are facts important to quality control, quickly determinable by the tensile testing machine shown in illustration. Many other sensitive and intricate machines are employed today by the great force of trained steel research engineers and metallurgists in their work in laboratories and steel plants.

Better mortar due to metallurgist. The army had difficulties with field mortars, base couldn't stand the gaff, wore out before barrel. Young J&L metallurgist suggested trying special J&L-made armor plate for base. Ordnance worked it out. New base proved superior, even permitted greater powder charge, which lengthened mortar's range.

Miniature steel works, with small steel furnaces and rolling mills, is invaluable adjunct to department of research and metallurgy at J&L. In this pilot plant, first of its kind in steel industry, many important developments in steels were worked out before the war. Since the start of the war, a number of advancements in steel products were perfected here, put in production in J&L and other steel plants, contributed greatly to the arming and protecting of our fighting men.

Steel armor rolled on J&L strip mills, for tanks, guns, planes, after Army Ordnance proved it under fire, was developed (1942) in J&L pilot plant, from a peace-time formula of metallurgical research. The basic formula was one that J&L metallurgy had successfully worked out for oil country steel obliged to take severest punishment.

Metallography, or microscopic examination of steel, was developed by Sir Henry Clifton Sorby in 1849, is routine practice today.

Ginger snap micro-photo was submitted in jest to late Prof. Albert Sauveur (1863-1939), dean of American metallurgists, because structure of cookie resembled Sauveur's experimental photos of mild steel under microscope. Despite joshing, Sauveur persisted in development of science of metallography, now universally in use in steel research, and was awarded Bessemer medal of 1924. He held chair of metallurgy at Harvard.

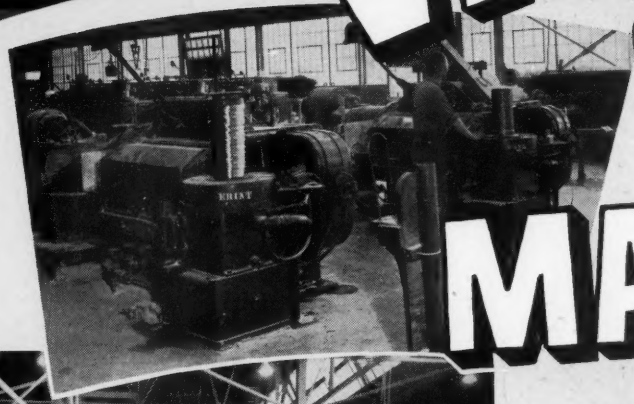
De Re Metallica, first scientific treatise on mineralogy and metallurgy, 20 years in preparation, profusely illustrated with woodcuts, was written in Latin and published in early 16th century by Georgius Agricola, pen name for Georg Bauer, a Saxon. The work, translated into other languages, was text book for several centuries. Recent English translation (1912) was made by Herbert Clark Hoover and wife, the late Lou Henry Hoover.

"To arouse intelligent minds to action" was stated purpose of another pioneer scientific author, Vannoccio Biringuccio. His *Pirotechnia,* published 1540, treated of mineralogy and metallurgy and sold 30,000 copies, a medieval best seller.

VAUGHN

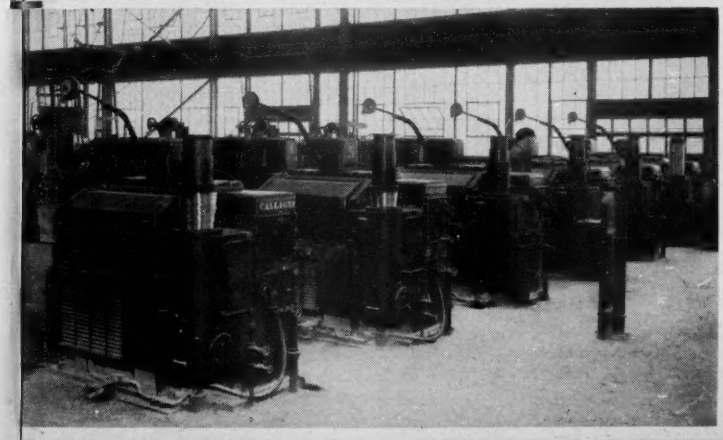
Wire Drawing

MACHINERY



Versatility for

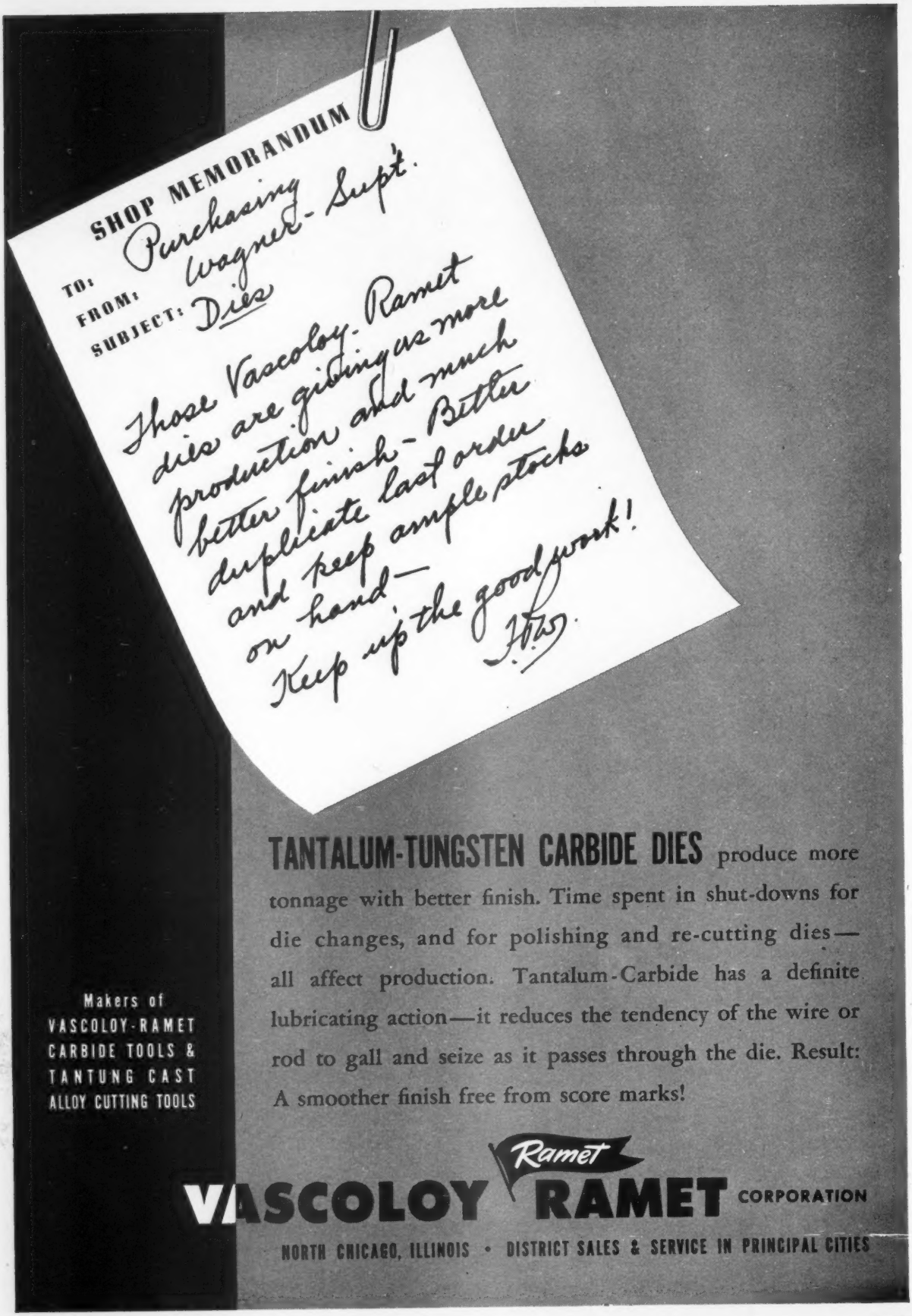
THE GREATEST DEMANDS OF PRESENT PRODUCTION— AND THE COMING REQUIREMENTS OF YOUR PEACETIME MARKETS!



THE VAUGHN MACHINERY COMPANY

CUYAHOGA FALLS, OHIO

Complete Cold Drawing Equipment . . . Continuous or Single Hole . . . For the Largest Bars and Tubes . . . For the Smallest Wire . . . Ferrous, Non-Ferrous Materials or Their Alloys.


SHOP MEMORANDUM
TO: Purchasing
FROM: Wagner - Supt.
SUBJECT: Dies
Those Vascoloy-Ramet dies are giving us more production and much better finish - Better duplicate last order and keep ample stocks on hand—
Keep up the good work!
F.W.
TANTALUM-TUNGSTEN CARBIDE DIES produce more tonnage with better finish. Time spent in shut-downs for die changes, and for polishing and re-cutting dies—all affect production. Tantalum-Carbide has a definite lubricating action—it reduces the tendency of the wire or rod to gall and seize as it passes through the die. Result: A smoother finish free from score marks!
Makers of VASCOLOY-RAMET CARBIDE TOOLS & TANTUNG CAST ALLOY CUTTING TOOLS
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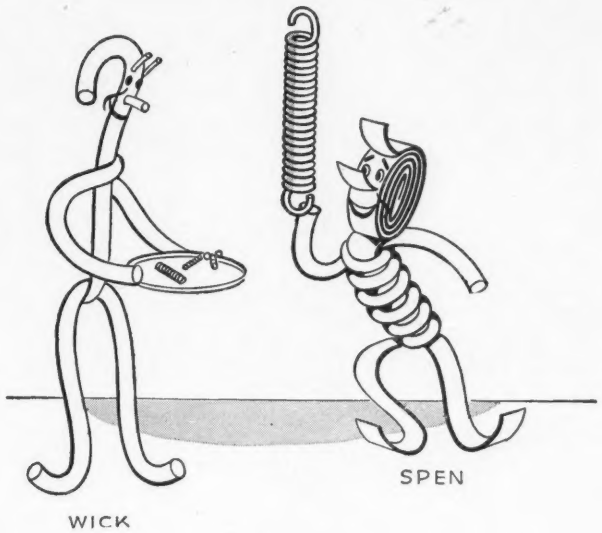
VASCOLOY RAMET CORPORATION
NORTH CHICAGO, ILLINOIS • DISTRICT SALES & SERVICE IN PRINCIPAL CITIES



See WICK and SPEN

for wire that's best for the purpose intended

Let's discuss wire for springs, for example.

Whether you require a wire soft and ductile for severe forming before hardening, or a strong, tough, hard drawn or tempered wire, experts Wick and Spen can meet your needs.

Our ability to meet exact specifications is based upon three factors: (1) our 123 year experience in making wire and wire products; (2) a competent staff of metallurgical engineers, and (3) complete control of manufacture, from making of the steel through wire drawing and finishing procedures.

If you have a difficult problem involving a new type of wire application our metallurgists are ready to cooperate in finding a solution. And, whether you buy in moderate amounts or in carload lots, you will be assured of the same prompt, dependable service that has earned the confidence of our hundreds of old-time customers.

We can supply high or low carbon steel wire—round, flat or shaped; in a wide variety of sizes, tempers, grades and finishes. If you have wire questions or a wire need come to Wire Headquarters.

A NEW SUBSIDIARY

The Wickwire Spencer Steel Company announces the purchase of the Sirian Wire and Contact Co. of Newark, N. J. and the formation of a new subsidiary —The Wickwire Spencer Metallurgical Corporation. Fine drawn tungsten and molybdenum wire and rods, as well as tungsten carbide dies and tools, will continue to be manufactured.

Send your wire questions to

WICKWIRE SPENCER STEEL COMPANY

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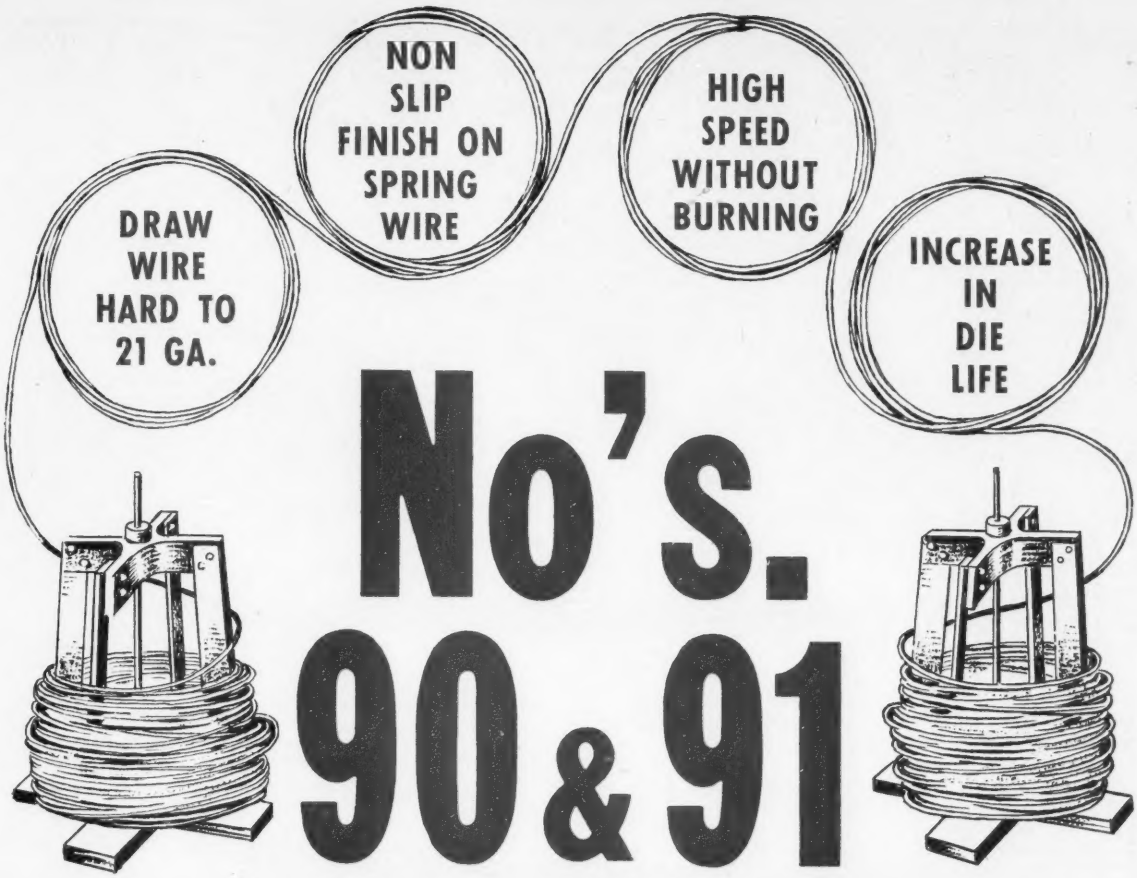

No's. 90 & 91

FOR GENERAL WIRE DRAWING

FOR mild steel or high carbon steel wire drawing, No.'s 90 and 91 Standard Wire Draw are designed for continuous drafting without any intermediate anneal, so that wire may be drawn from the rod to finish at 21 Ga. or smaller.

Numbers 90 and 91 Standard Wire Draw are special high titre soaps, which when used as shipped on high carbon, impart a non-slip coating to the wire so necessary on spring wire when knotting. Because of the high titre characteristic these lubricants can withstand high speed without burning and will yield exceptional die wear.

STANDARD INDUSTRIAL COMPOUNDS CO.
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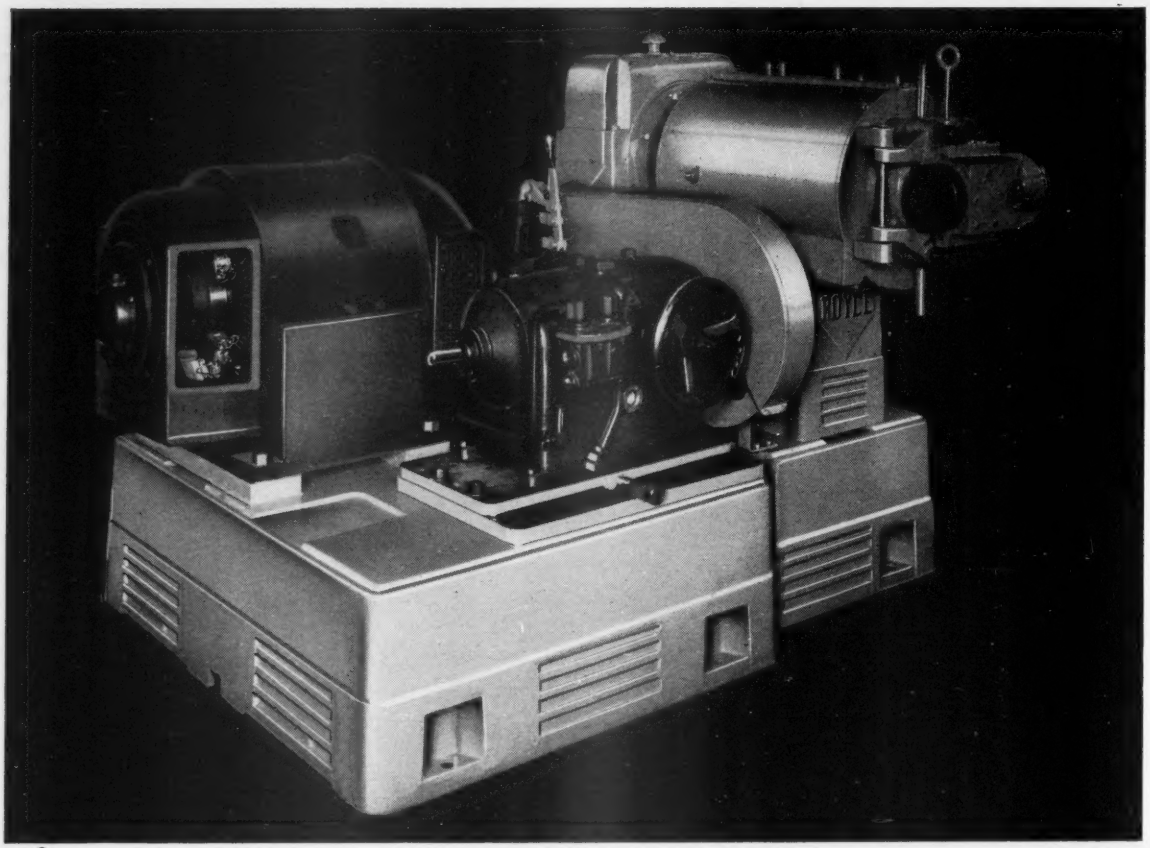

65 Years of Progressive Pioneering

Beginning with the invention of the screw-type machine in 1880 John Royle & Sons have constantly pioneered in the development of continuous extrusion equipment.

Essentially the continuous extrusion process hasn't changed a great deal. There have been refinements—the most apparent being in the field of temperature control and in the development of accessory equipment.

Sixty-five years of progressive pioneering have produced a wealth of knowledge and experience. This "know how" is built into Royle equipment—reflected in performance records.

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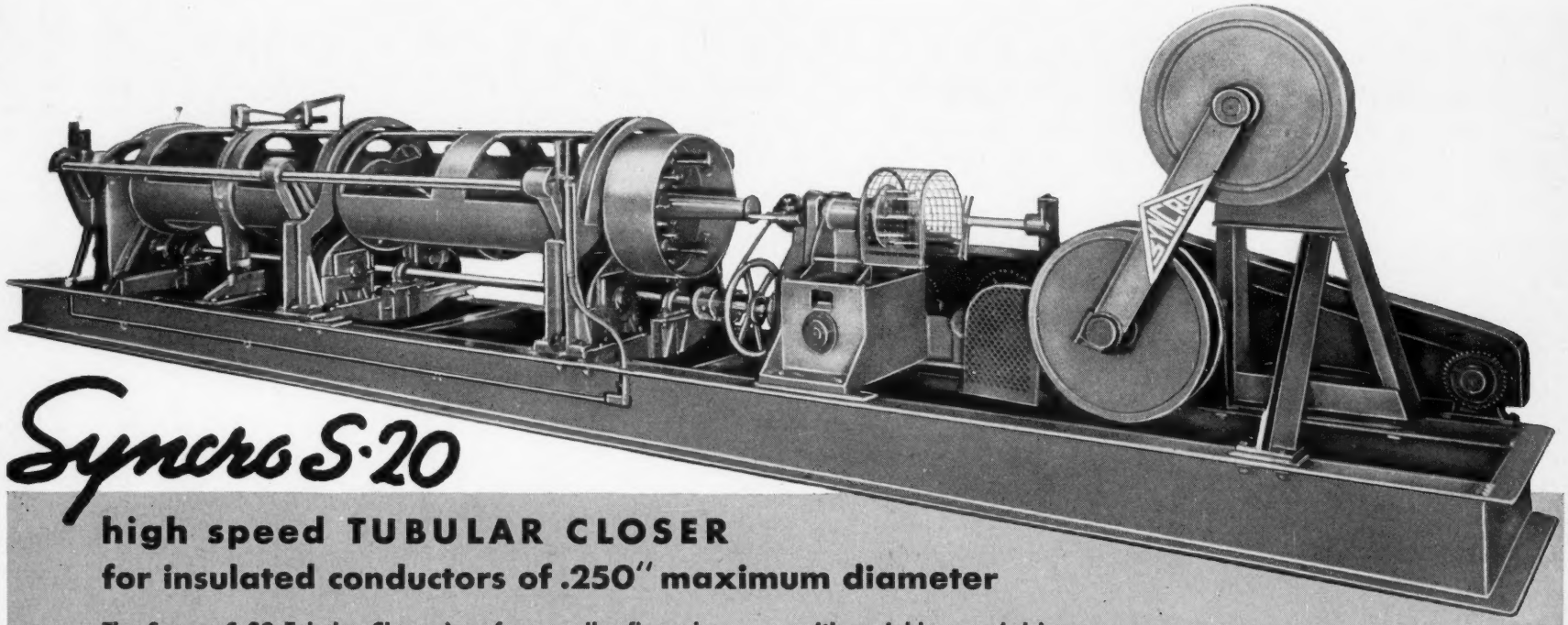


Syncro S-20

high speed TUBULAR CLOSER

for insulated conductors of .250" maximum diameter

The Syncro S-20 Tubular Closer is a four cradle, five wire machine, designed for 16" diameter bobbins. It has a maximum tube speed of 750 RPM and is equipped with solenoid brakes. Smooth, shockless acceleration is assured by the Syncro built, Rawson coupling drive.

The cradles are supported in anti-friction bearings, equipped with pressure lubrication fittings. All cradles are provided with automatic safety reel arbor locks.

When required, the jute serving spindles are self contained, and when required, the binder head is equipped with variable speed drive.

The machine is furnished with grooved double capstans and variable lay is obtained through change gears.

Not shown is the friction driven, or independent motor operated magnetic clutch driven take-up, which is included with the machine.

The S-20 closer can be built to process any number of individual conductors and fillers. When used for bare wire stranding, an automatic broken wire stop is provided.

Write for complete details.

SYNCRO MACHINE COMPANY

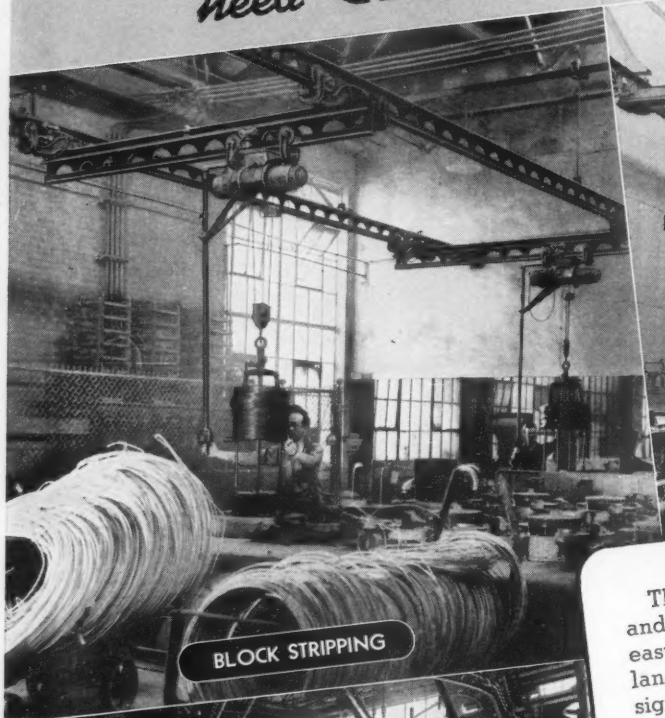
EXECUTIVE OFFICES AND WORKS—611 SAYRE AVENUE, PERTH AMBOY, N. J.

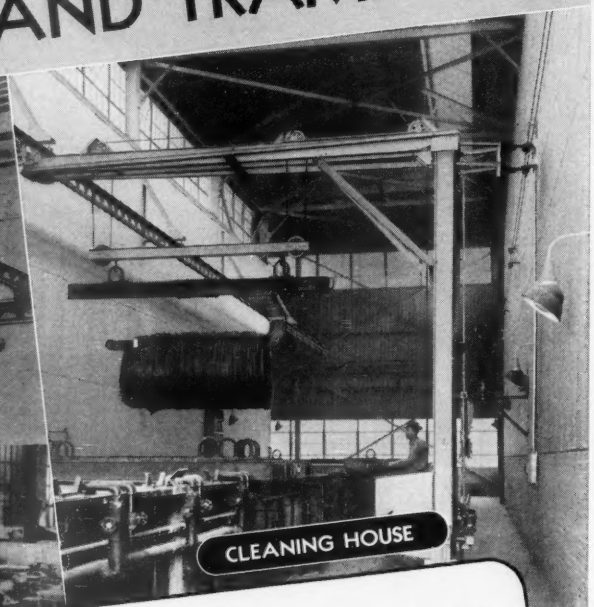
113 SOUTH JEFFERSON STREET, CHICAGO, 6, ILL.
REPRESENTED IN CANADA BY
CANADIAN ELEVATOR EQUIPMENT CO. TORONTO

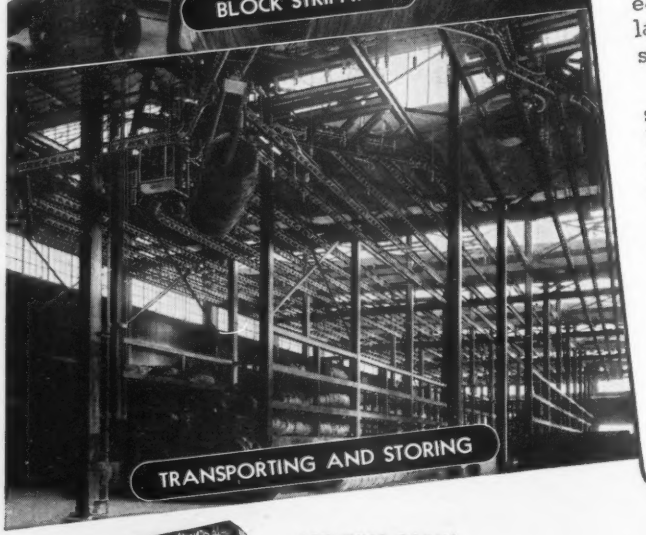
Machinery for the Wire Industry

SYNCRO

ROD AND WIRE PLANTS *need* CLEVELAND TRAMRAIL





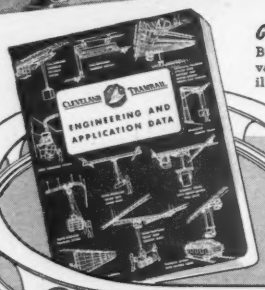


The hard work in the cleaning, drawing and handling of wire and rod has been made easy, fast and safe by application of Cleveland Tramrail equipment especially designed for the work.

Perhaps no other single factor has been so influential in increasing production and lowering costs in the wire or rod mill as properly designed and applied overhead materials handling equipment.

Today more producers and fabricators of wire and rod are enjoying the many advantages of Cleveland Tramrail than ever before and the list of prominent names in this industry is growing rapidly.

It costs you nothing to learn what Cleveland Tramrail can do for you, but it may be of tremendous importance in the immediate years ahead. Why not investigate now?



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CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1141 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Cuprodine

A UNIQUE METALLIC LUBRICANT

CUPRODINE is a powdered chemical which, when dissolved in a dilute sulfuric acid, produces adherent, bright copper coatings on steel surfaces by simple immersion without the use of current.

Cuprodizing wire and other steel surfaces to be drawn facilitates and improves drawing, reduces metal pickup, increases production, prolongs die life and minimizes scratching and breakage.

A polished steel surface when magnified appears rough — covered with pin points and file-like ridges.

In drawing with usual lubricants, depending upon soap, lime, grease, etc. for their effectiveness the microscopic sharp edges and points push through the lubricating film. Some of them, due to their minute size, are heated sufficiently to weld to the die with the result that either the die or the work tears out.

Cuprodine does not lubricate in the ordinary sense of the word. Its unusual effectiveness is due not only to the copper coating it forms on the metal but largely to the removal of the microscopic ridges and points. These are selectively dissolved by the acid of the Cuprodine bath, causing the copper to plate out of the solution in a thin, tight coating on the work.

The sharp points and ridges, responsible for failure with ordinary lubricants, are gone. The relatively smooth surface is coated with an even coating of soft copper.

Cuprodized surfaces may be made more rust resistant if treated with Cuprotek.

Manufacturers of Inhibitors & Metal Working Chemicals

AMERICAN CHEMICAL PAINT CO.

AMBLER ACP **PENNA.**

Note: West Coast Plants may address inquiries and orders for prompt delivery to: Leon Finch, Ltd., 728 East 59th St., Los Angeles, Calif.

American Chemical Paint Company, Ambler, Pa.

Please send me general Technical Service Data Sheets on

☐ Cuprodine ☐ Cuprotek

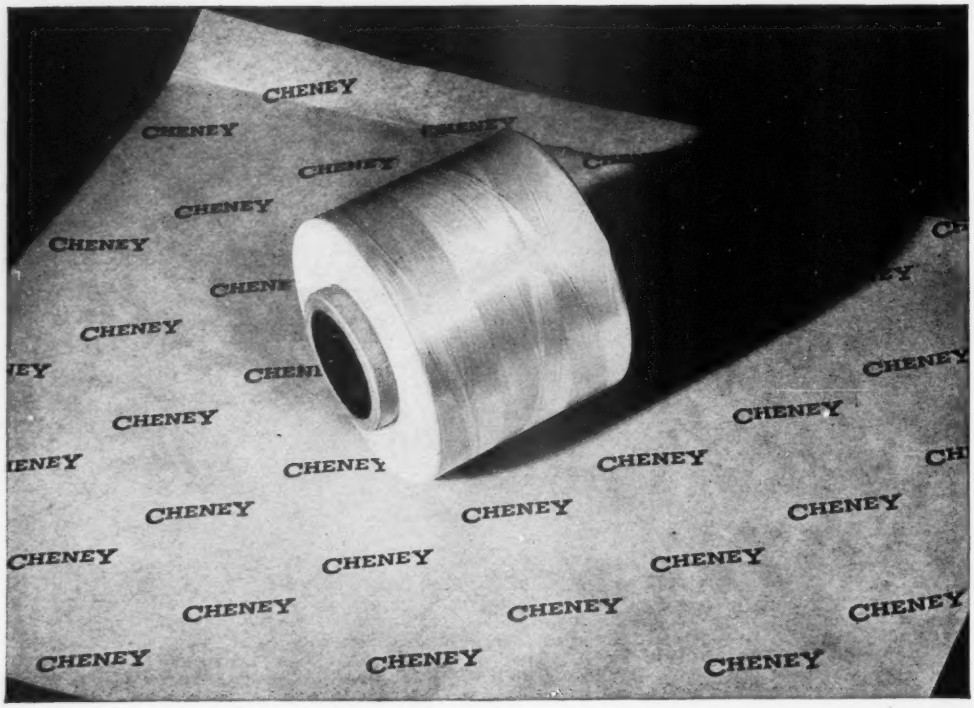
*Name*_____ *Title*_____

*Company*_____

*Address*_____

D-6

CHEMICALS ACP PROCESSES



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Scientifically Put Up . . .

Nylon Insulating Yarns by Cheney Brothers

THESE SUPERIOR YARNS are made with all the "know-how" of a famous name and a century of textile experience. Every detail of the put-up is carefully arranged to meet the customer's specifications. Then every perfectly wound tube is wrapped and labeled in the distinctive Cheney package.

But yarns for electric wire insulation are just one of many new Cheney developments. For even now Cheney Brothers are looking to the future—planning fresh and vigorous expressions of the famous Cheney tradition.

Some of these plans are complete; some are still in the making. And all will contribute to better living in the peacetime world of tomorrow—the world we are building with the War Bonds we buy today.

★ CHENEY YARNS

CHENEY BROTHERS

Manufacturers of fabrics of exceptional quality since 1838

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Velvets—Pile Fabrics—Upholstery and Decorative Textiles—Men's Wear Fabrics
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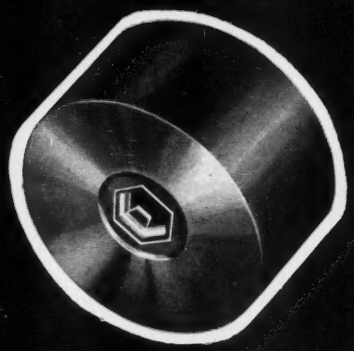

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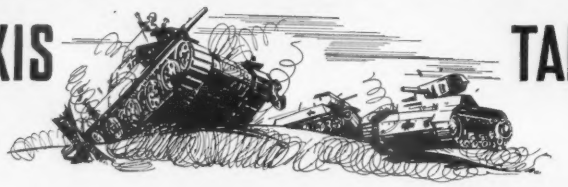
TANGLE AXIS  TANKS and TRUCKS

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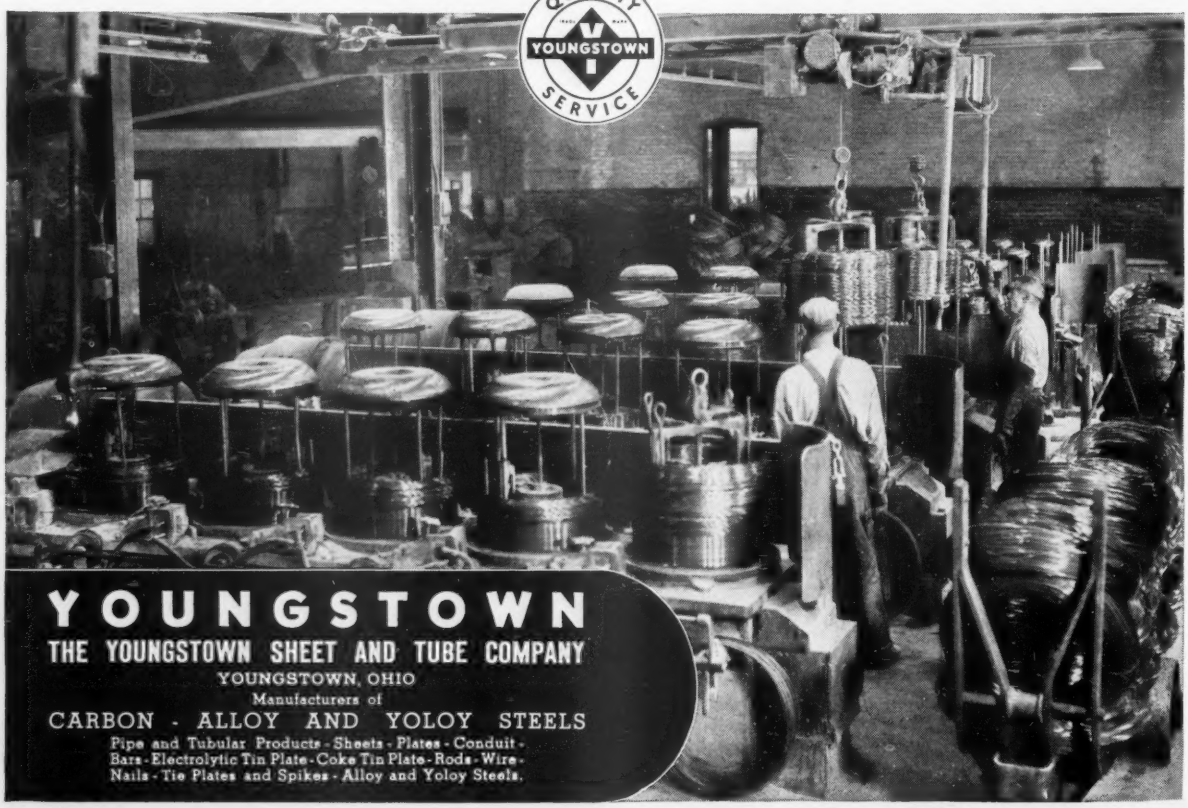

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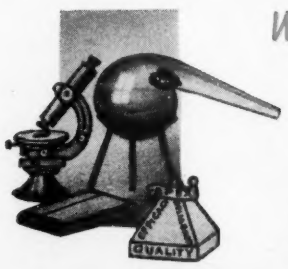

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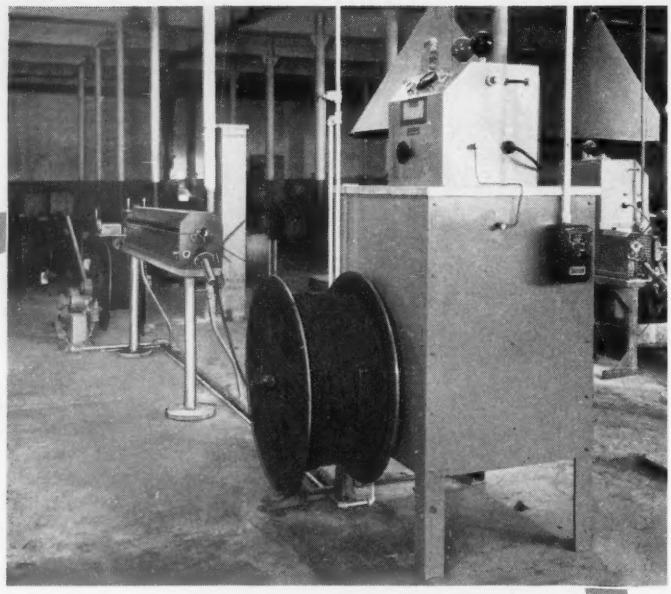

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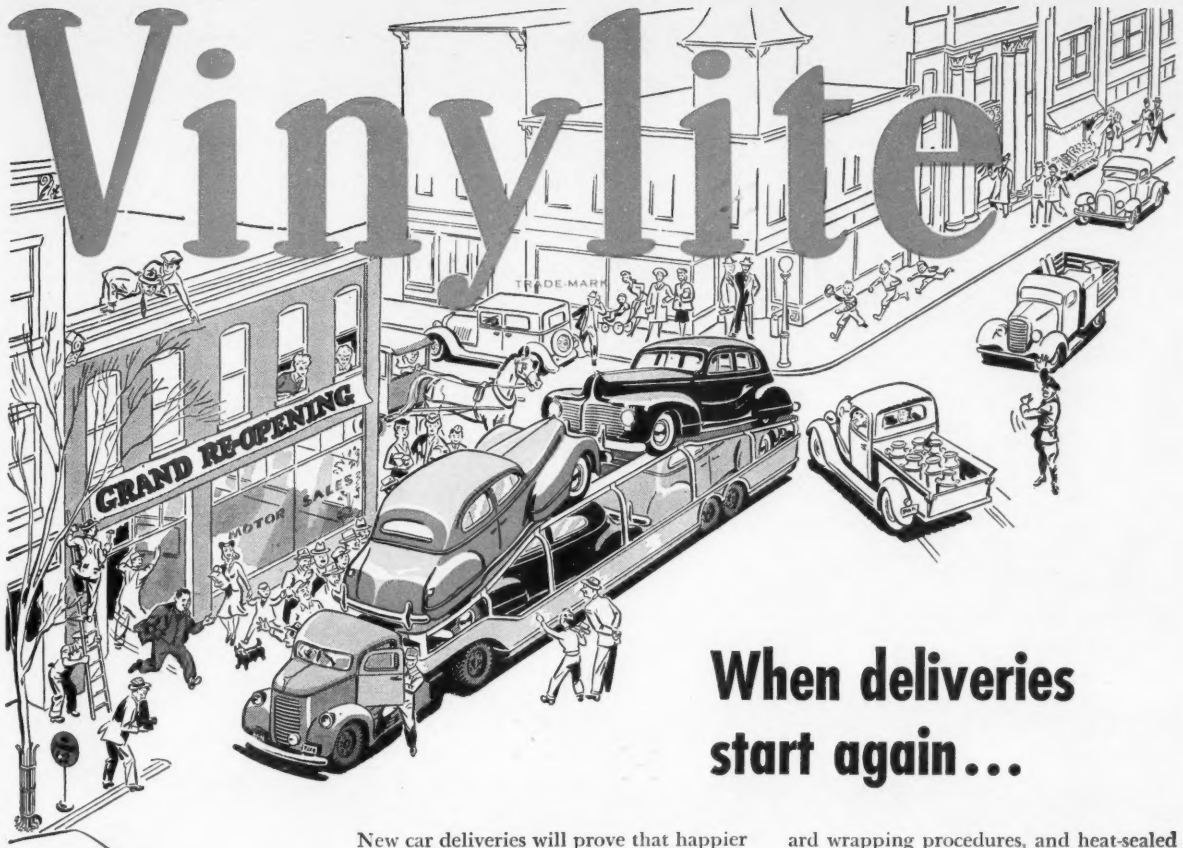

When deliveries start again...

New car deliveries will prove that happier days are here again. Though they look like prewar models, they'll be better cars—improved in many ways. Harness-type wiring systems wrapped in VINYLITE plastic tape, for instance, will be far safer and more dependable than any former assemblies. This unique tape is used on the multiple circuit harnesses of almost every combat vehicle and truck that's built today.

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Besides their use as insulating tapes, VINYLITE plastics are available as extrusion materials for primary insulation, tubular jacketing, and conduits. Wherever used, they bring new economy and safety to the electrical wire and cable field. You will probably find them a real investment in connection with your own products, present or planned. Write for descriptive booklet 30-VR, "Vinylite Plastics for Wire and Cable Insulation."

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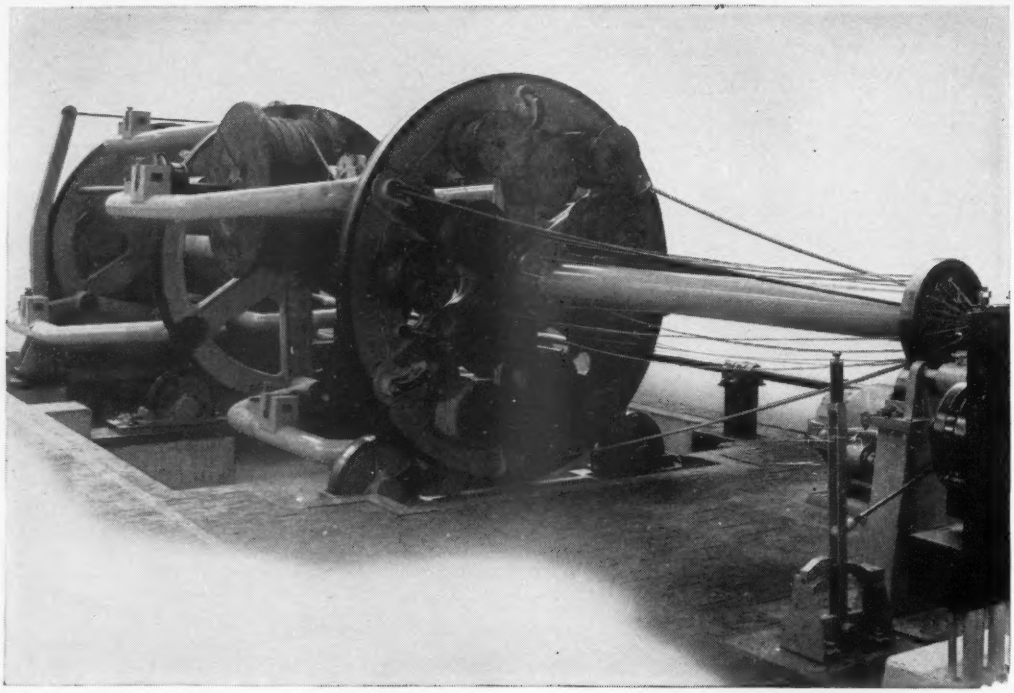

The machine illustrated is a seven conductor cable closing machine with maximum capacity of 60" flange diameter reel. Space is provided for ample supply of jute fillers.

We are prepared to supply this type of machine in various sizes up to a maximum of 60" reel diameter for 3 to 8 conductors.

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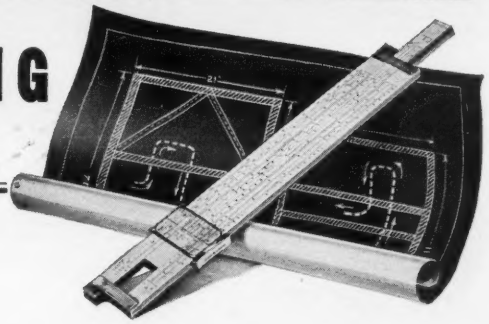
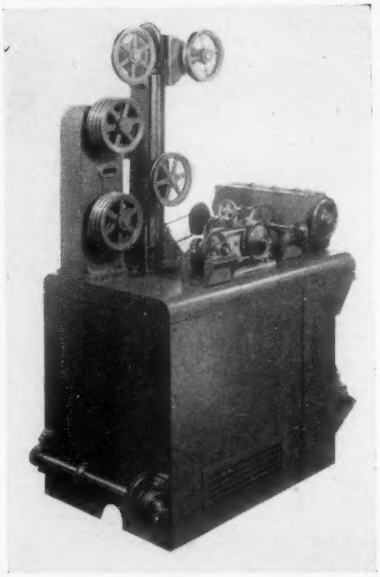


Speed Increased, Finish Improved, Attendant Labor Cut to Minimum By IOE Cable Lacquering System



IOE coating and impregnating systems for wire, cable and allied products have brought about a decided improvement in the standards of the industry. They are now operating in leading plants throughout the United States, producing beautifully finished wire at speeds from 3 to 5 times faster than those of previous equipment. Not only surface finish but dielectric strength and cross sectional accuracy are distinctly superior.

Each **IOE** unit is compact and easy to operate, with readily accessible lacquer and saturation pots, quickly changed unwind stands and high-speed constant-tension takeup machines. Result: under normal conditions **one man can handle an 8-end system producing 48,000 lineal feet of medium size cable per hour!**

Takeup Units

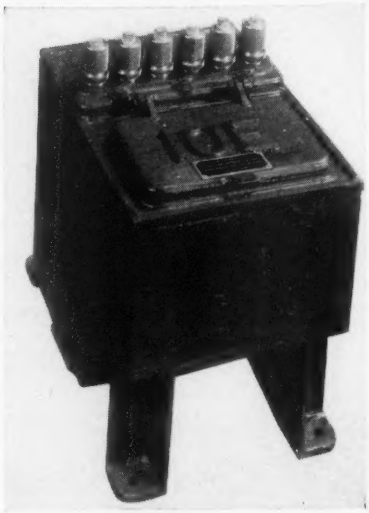
These high-speed constant-tension takeups, complete and self contained, are made in standard sizes with a wide range of speed and tension. Their adjustable wire lay gives them extreme flexibility, and they are adaptable for many different materials.

Saturation Pots

Saturation pots of remarkably advanced design are included in all **IOE** systems. These are supplied for any number of immersions from 3 to 25, hold thin saturants, and are equipped for pressure feed and quick draining. They are completely accessible and easily threadable.

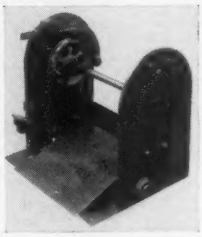
Lacquer Pots

IOE lacquer pots are designed for single or multi-pass lacquering, and are furnished in single-pass, standard for saturation, and 5- and 6-pass, standard for lacquering. They are made of cast aluminum or iron in three standard sizes, equipped with optional pressure feed, lower seal control and wiper control.



Their use assures 100 percent coverage of braid, while positive wiping eliminates excessive lacquer coating.

Payoff Stands



The payoff stands used are equally efficient, affording controlled tension at all times and thereby eliminating backlash. They are foot-pedal loaded, the operator simply rolling the reel into position and stepping on a foot pedal which simultaneously raises the reel and sets a counter-weighted tension brake.

Drying Tower

The principal unit of the system is a highly efficient explosion-proof vertical oven, designed to produce an extremely high gloss finish with absolute safety. It can be heated by electricity, gas, oil or steam, and maximum recirculation of atmospheres is attained despite the extreme volatility of the impregnants and lacquers used. All such oven towers are completely accessible and are adapted to existing buildings without inconvenience to the user.

Note: IOE *lacquer systems are also applicable to finishing of coated cords, fishlines, tapes, coated filaments and fibers.*

GET COMPLETE DATA

This page gives only a bare outline of **IOE** cable lacquering equipment. For full information, send for a free copy of "Lacquering of Insulated Wire and Cable", a 16-page reprint of our authoritative article in **Wire and Wire Products.**

(This is No. 16 of a series. Reprints of previous advertisements will be sent free upon request.)

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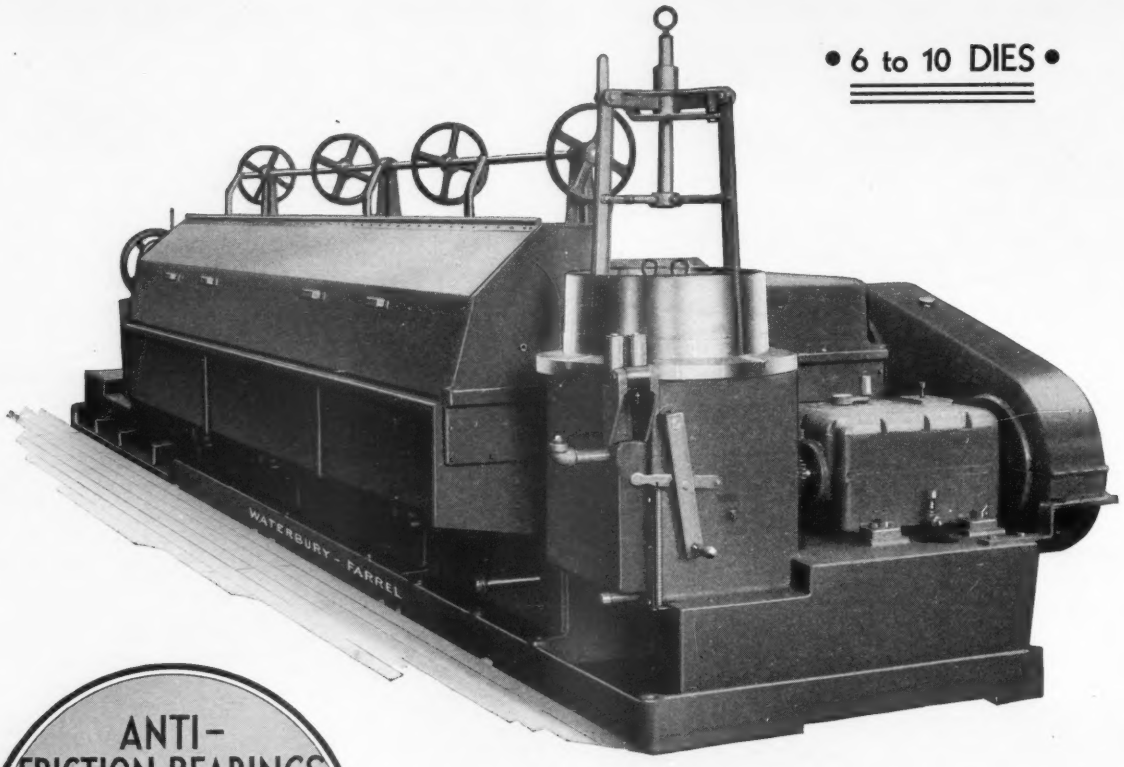

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 19 DECEMBER, 1944 No. 12

Designated as

Official Publication By The Wire Association

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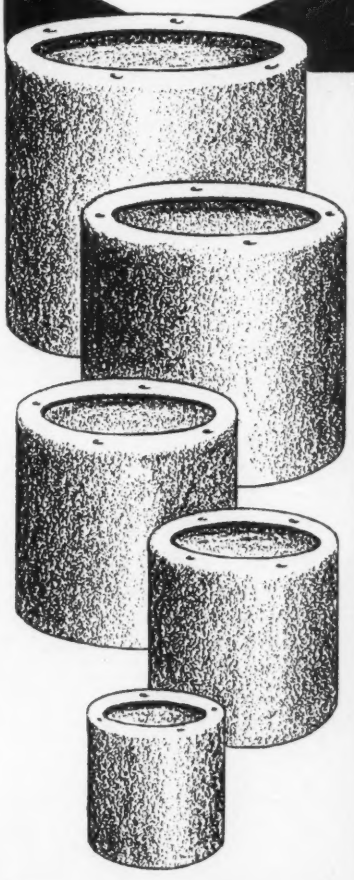

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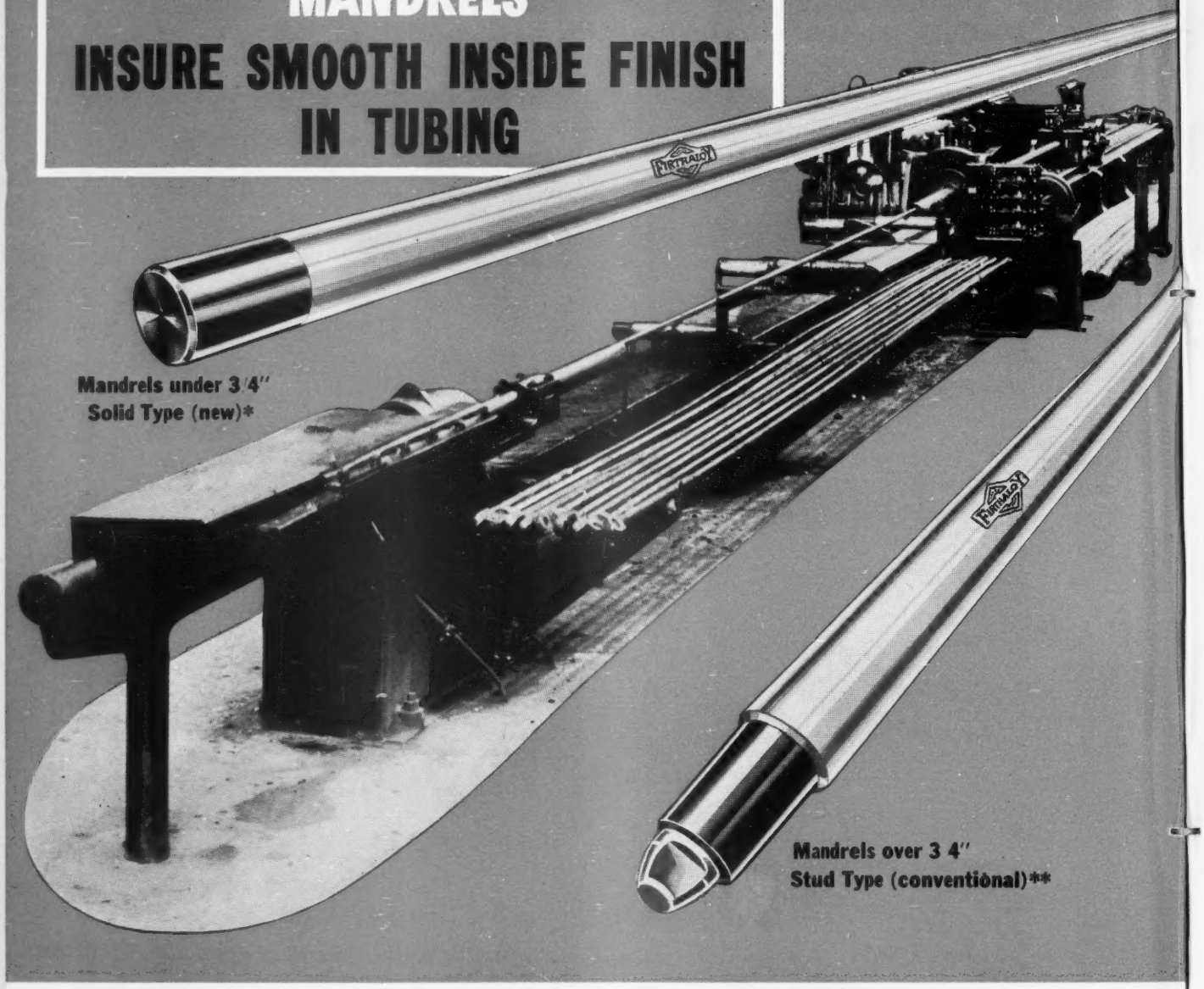

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A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 19 DECEMBER, 1944 No. 12

Covering Weatherproof Cable

By Robert M. Harbeck
Fidelity Machine Company, Philadelphia, Pa.

A paper presented at the Annual Convention of the Wire Association at Pittsburgh, Pa., October 16-19, 1944. ✦ ✦ ✦ ✦ ✦

WHILE the subject of this paper is "Covering Weatherproof Cable" it is concerned principally with covering solid wire and is concerned more specifically with a new knitting process. This process can be used to manufacture weatherproof wire with about one-fourth the labor, less than one-half the floor space and a considerable saving in original cost and maintenance over the present methods. This new method is known as the Sinfra process and by it the wire or cable is given three knitted coverings applied simultaneously at a speed of about fifteen times that of the present usual method.

IMAGINE one of these three covers as being slit lengthwise with the wire and flattened out. The pattern resulting is shown in Plate I. It may be seen that the loops are on the diagonal. In general this means that the pattern is knitted in a spiral around the wire. Alternate rows are connected by the same yarns and the connecting yarns pass above and below the intermediate loops thus tying the whole cover together. In the picture shown it may be seen that there are eight ends of yarn as represented by the horizontal lines. The vertical distance represents the circumference of the wire, so the wire can be imagined as extending indefinitely in a horizontal direction. The angle at the left, called the angle of mesh, represents the angle the spiral pattern makes with a cross section of the wire.

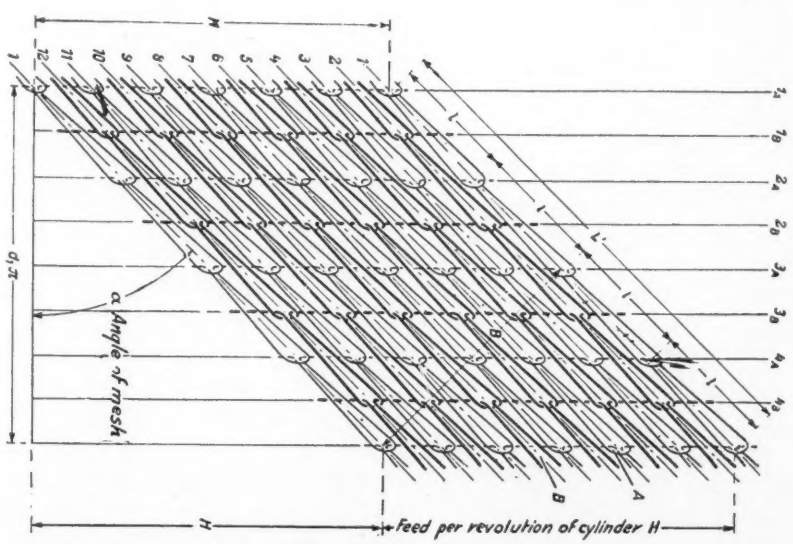

Plate I. Schematic drawing of the Sinfra process pattern for covering weatherproof wire. The wire extends indefinitely in a horizontal position. The above pattern is knitted during one revolution of the knitting head. ✦ ✦ ✦ ✦ ✦ ✦ ✦

Designated as Official Publication by the Wire Association

IT can be seen that the weight of the cover may be increased or decreased by changing the number of loops per lineal inch along the wire. Because the ends of the yarn connect alternate loops, there are really two layers of fabric on this cover held together and in place by the connecting yarns. If this cover is applied in a fairly loose stitch, little or no internal stress is introduced in the process.

✦ ✦ ✦

OVER a period of eight years the Fidelity Machine Company has thoroughly demonstrated the advantages of covering weatherproof wire and cable by this knitting process in conjunction with several of the most important manufacturers of weatherproof wire. It is small wonder that today many organizations both prefer and purchase this type of covering.

✦ ✦ ✦

THIS knitted process of covered wire has been accepted by the Signal Corps of the U. S. Army and many hundreds of miles of wire have been covered for them and are now being used in the field.

✦ ✦ ✦

IN applying a cover on weatherproof wire it is necessary to know the exact weight of cotton yarn applied per thousand feet, so we have developed a formula to predict the weight of cotton yarn required. To understand that formula, it will be necessary to explain some of the features of the Sinfra machine and how it works.

✦ ✦ ✦

PLATE II shows a general view of the Sinfra machine as now manufactured. The bare wire can be seen on the right passing through the wire straightener, then through the three knitting heads, each one of which applies a knitted covering to the wire, then being wrapped around the capstan a half dozen turns, and off to the haul-off stand not shown in this view. The capstan is geared to the motor and travels at a fixed and constant speed. It has been found that radically different diameter wires require different speeds, so a number of change gears are provided and can easily be installed to change the speed of travel of the wire.

✦ ✦ ✦

THE three knitting heads are geared to a common counter shaft which in turn is geared directly to the motor, so that the heads revolve at a constant speed. These knitting heads revolve around the wire and contain from 10 to 14 needles which do the knitting in a spiral. The center head is rotated in a direction opposite to the other two so that the spirals will cross each other and cover all the interstices of the preceding covers. The cotton yarn, in 2 to 5 lb. cones, is placed on the spindles of the supply stand in the rear of the machine. The upper deck provides a convenient storage shelf for replacement cones. The yarn is guided through individual electrical stop motion devices under the top deck to the knitting heads. The lever near the center of the counter shaft enables attendant to operate machine by hand at a very slow speed.

✦ ✦ ✦

PLATE III shows a view of a knitting head with the cap removed, so that a better view of the needles can be obtained. This cap is removed when it is desirable or necessary to change the needles. The assembly on the left rotates at a speed of about 480 RPM The three heads are designed to hold 12 needles in the first two and 14 in the last one. As explained before it is possible to change the weight of the cover by changing the number of loops per lineal inch. Each needle forms one loop in the pattern of the cover shown previously in the diagram. As the heads rotate at a fixed speed this change in weight can be accomplished by removing two diametrically opposite needles on any or all of the heads.

✦ ✦ ✦

PLATE IV shows a magnification of the business end of a knitting head. The yarn is seen guided through loops on the right and diagonally downward to the left. The ends of the needles shown are provided with a hook at the very end to catch the yarn, and a latch which is free-moving and will open or close as forced by the yarn.

✦ ✦ ✦

THE second needle from the top in front is shown ready to move to the left and catch the yarn. The second needle below that one has already grabbed the same strand and is at the lowest point of its cycle. It will be noticed that the needles alternate in employing each strand. The first needle on the top

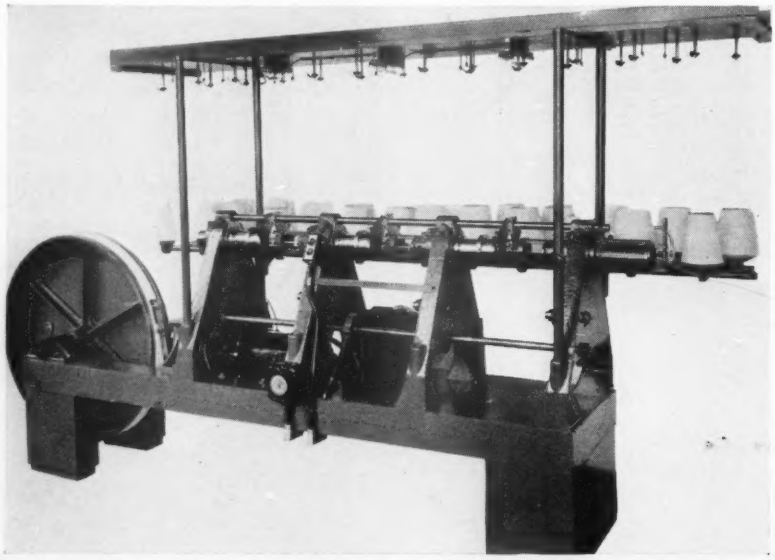

Plate II. Shows a general view of the present triple-head Sinfra machine for covering weatherproof wire at a speed of about 1800 ft. per hour. ✦ ✦ ✦

in front is still moving to the right and will pass in front of the diagonal strand of yarn first mentioned.

✦ ✦ ✦

WHILE the left half of this assembly is rotating downward, the upper part containing the yarn guides is fixed so that when the first needle is on its path to the left it will be in a position to catch the second diagonal yarn from the top. As the needles enter the head, the loop of yarn previously engaged is forced to the right against the latch, closing that and forcing that loop off the end of the needle. In this way the cycle is complete. It should be remembered that the left half of this assembly is rotating at a speed of 480 RPM and each needle makes four complete cycles per revolution of the head. Thus the needles travel at a speed of nearly 2000 cycles per minute. The distance of travel of the needles is roughly about an inch. In starting a new thread it is necessary only to lead the yarn through the proper guides, then hold it diagonally in front of the needles, operate the machine for a few turns by hand and the needles will pick up the yarn at the proper place. Broken yarn can be repaired by tying an ordinary knot in the two ends. The machine will carry the knot through the needles satisfactorily.

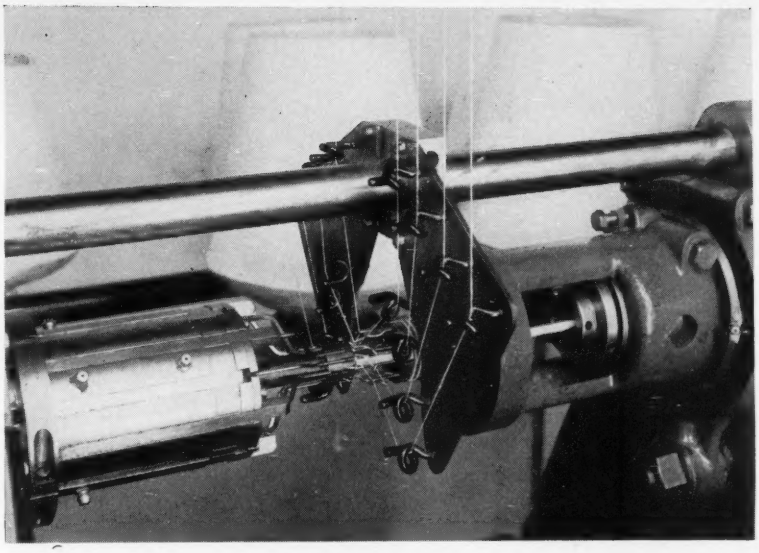

Plate III. Shows a close-up of one of the rear knitting heads with the protecting cap removed.

✦ ✦ ✦

THIS machine applies three covers to wire from size AWG #14 to and including #4. Another model of the Sinfra machine is now being manufactured to cover wire and cable from size AWG #4 to 300,000 circular mils. That machine has of course a larger capstan, larger openings in the heads as well as more needles in each head.

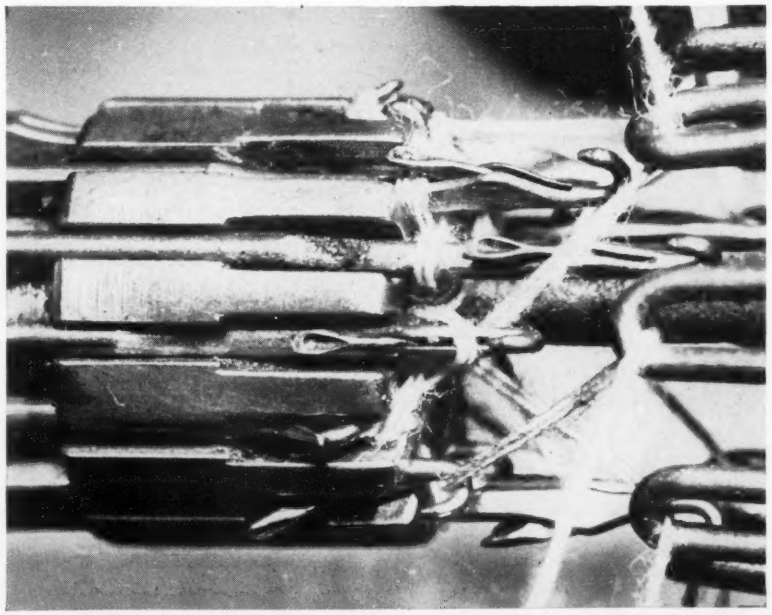

Plate IV. Shows a magnification of the knitting process.

✦ ✦ ✦ ✦

FROM Plate I, showing the pattern of the textile covering, the total length of yarn is computed for one revolution of the knitting head. Disregarding curves for the present, it can be seen that the diagonal length L′ times twice the number of needles gives the total amount of yarn in the diagonal direction. To this must be added the yarn going in a horizontal direction which would be eight times the advance of the wire of one revolution of the knitting head. The multiplier 8 is used of course because there are eight ends of yarn. To these two quantities must be added a theoretical quantity for the yarn at the corners of the loops. The latter quantity is best determined by tests under different conditions. The sum of these three quantities must be multiplied by factors to change the quantity per revolution to one thousand foot units of the covered wire. After simplification this formula obtained results within two or three per cent of weighed samples.

✦ ✦ ✦

THE advance of the wire of course is the distance the wire travels in inches for one revolution of the head. This distance varies between ½" and 1", and depends on the speed of the capstan as well as the speed of the head. The dis-

tance L′ can be computed as the hypotenuse of a triangle, one side of which is the circumference in inches of the previous cover on wire. The other side of the triangle is the advance of the wire, as explained above.

✦ ✦ ✦

THE result of our experiments is shown in Plate V. It seems rather complicated but it gives reasonably accurate results. Symbols, of course, are used for the different variables and are explained below the formula. This formula gives the weight of cotton yarn in pounds per thousand feet on one cover.

✦ ✦ ✦

THE relation between the advance, capstan speed, and the head speed is shown in the formula at the right, where the advance equals capstan speed divided by five times the head speed.

✦ ✦ ✦

FOR the second and third covers it is necessary to know the diameter of the cotton yarn in inches, as the diameter of the wire is increased by twice the diameter of the yarn on each cover.

✦ ✦ ✦

THE next formula shows the relation between the diameter of cotton yarn in inches and the count of yarn. If it is desired to know the length of yarn in feet used on any one cover the formula at the bottom of the slide can be used.

✦ ✦ ✦

THE American Standards Association specifications limit the total weight of the three covers to not less than 30% and not more than 40% of the total insulation on the weatherproof wire, and specify the total weight of insulation for each size wire.

✦ ✦ ✦

AFTER the wire is covered, a coat of asphalt is applied in another process and then a surface coat of wax is added. To provide a smooth surface and uniform diameter the wire is then drawn through a die, the size of which is determined in the A.S.A. specifications for each size wire. As the asphalt costs less than the cotton yarn it is economical to attempt to apply not more than 30% of the weight of the insulation in the knitted coverings. The ideal weight of the cotton yarn varies from 3.78 lbs. per thousand feet for #14 wire to 11.28 lbs. per thousand feet on #4 wire.

✦ ✦ ✦

SO it can be seen that the weight of the cotton yarn is controlled by the specifications and economics for each cover. The specifications do not determine the individual weight of each cover, so some flexibility is allowed here. By this we mean if the total weight of all covers is 7.5 lbs. per thousand feet the weight of the first cover can be two or three pounds per thousand feet; the second can be two or three pounds, but the outer cover must not be more or less than the balance required to make up 7.5 pounds per thousand feet.

✦ ✦ ✦

WE realize it would be time-consuming for the manufacturers to use these formulas, so we are making up a table showing the consumption of yarn under different known conditions.

✦ ✦ ✦

TESTS are applied to the saturant to determine softening points, penetration, pliability, loss by heating, rise in softening point and change in penetration after heating. The finished wire or cable is also submitted to tests which include conductor tests, mineral filler content, thickness of covering and weights of the component parts of the finished wire. The finished wire is also required to pass a bending test whereby the wire is wrapped around its own diameter at a temperature of 32 degrees Fahrenheit. This is a severe test of the textile covering but the Sinfra product well meets the requirements of this and all other A.S.A. physical tests.

THE Fidelity Machine Company has long made standard type maypole Braiders. As you know the product of these machines is simply a number of ends of yarn braided to form a covering on the wire.

✦ ✦ ✦

BASICALLY maypole braiding machines are limited in speed because of the principal of operation of crossing carriers. The size of the package must also be limited because of the centrifugal forces imposing severe wear on the various parts and the resulting disadvantages of size.

✦ ✦ ✦

GENERALLY speaking the weatherproof wire manufacturers using maypole type braiding machines through limitation of package and design, can at the best operate at a speed two to three feet per minute. The Fidelity principal of covering wire by using stationary packages and revolving the small diameter knitting head jumps the practical size of the package to one limited only by winding machine capacity. The package remains stationary at all times and the design of the knitting head permits the astounding increase of speed of production to approximately 30 feet per minute, or in multiplication of that of the maypole type braider by ten to fifteen times.

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THE cone type packages used on Sinfra are the standard size known to the textile industry and can be used as they are commercially produced. On the other hand, as you know, the braiding machines require these packages to be rewound on a backwinder to packages of only a few ounces in size. Again, the three braided covers on the wire involve three sets of carriers operating one above the other. About 12 carriers braid the first cover, 16 carriers braid the second cover and 20 carriers braid the third. Thus a usual total of 48 carriers each with two ends of yarn are required to braid the three covers on the braiding machine.

IT has been noted before that on the Sinfra Machine 8 cones are needed on each cover, making a total of 24 cones and 24 ends of yarn for the operator to watch.

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INVESTIGATION was made at one Company of the comparison between Sinfra Machines and Braider production. The Sinfra Machines were operated at a speed of 1840 feet per hour. Because of interruptions due to changing reels, replacement of cones and the repairing of broken yarn the overall average production from Fidelity Sinfra Machines at that Company was 1650 feet per hour. Production from standard braiders at that same Company was at a top speed of 130 feet per hour and overall average of 100 feet per hour, so we estimate that one Sinfra Machine is equivalent in production to about sixteen and one-half triple head braiders.

✦ ✦ ✦

THE floor space required for one Fidelity Sinfra Machine including haul-off reel, wire supply stand and aisles is about 280 square feet per machine. The floor space required for 16½ braiders and the necessary aisles and haul-off reel and supply stand is about 530 square feet. Additional floor space required for the backwinders necessary for 16½ braiders is an additional 125 square feet making a total of 655 square feet. For the same production Fidelity Sinfra Machines require only 43% of the floor space.

✦ ✦ ✦

THE installation cost of one Fidelity Sinfra Machine and the haul-off stand is substantially less than the cost of equivalent braiders and backwinders.

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ONE operator is required for about 20 braiders, a part-time operator is required for the equivalent in backwinders, so we estimate one operator is required for production from braiders and backwinders equivalent to that of one Sinfra machine. On the other hand a Sinfra machine operator can handle at least two machines and has handled as many as four, so it can be seen that the Sinfra machine saves 50 to 75% in labor.

✦ ✦ ✦

IN conclusion therefore, we have shown that by using the Sinfra knitting process in covering weatherproof wire, the labor costs may be as little as one-fourth, the floor space less than half, and the installation costs considerably less.

TOOLS USED	
1	
2	
3	

SINFRA

$$W = \left(N\sqrt{A^2+B^2} + 5\sqrt{A} + 1 - B\right)\frac{1}{1.26\,CA}$$

WHERE
W = POUNDS OF COTTON YARN USED PER 1000 FEET ON ONE COVER
N = NUMBER OF NEEDLES USED IN HEAD
A = ADVANCE OF WIRE IN INCHES PER REVOLUTION OF HEAD
B = CIRCUMFERENCE IN INCHES OF PREVIOUS COVER OR WIRE
C = COUNT OF COTTON YARN OR EQUIVALENT. THUS FOR 6/2 YARN, C = 3

$$A = \frac{K}{5S}$$

WHERE
A = ADVANCE, AS ABOVE
K = CAPSTAN SPEED IN FT/HR.
S = HEAD SPEED IN R.P.M.

$$D = \frac{0.0371}{\sqrt{C}}$$

WHERE
D = DIAMETER OF COTTON YARN IN INCHES
C = AS ABOVE
FOR FIRST COVER, B = (DIAMETER OF WIRE IN INCHES)3.1416
" SECOND " B = (" " " " " $+2D_1)3.1416$
" THIRD " B = (" " " " " $+2D_1+2D_2)3.1416$

WHERE
D_1 = DIAMETER OF YARN ON FIRST COVER IN INCHES
D_2 = " " " " SECOND " " "

$$L = 2520\,CW$$

WHERE
L = LENGTH OF COTTON YARN IN FEET USED ON ONE COVER PER M FEET OF WIRE
C, W = AS ABOVE

REVISIONS		
NO.	DATE	BY

DEPARTMENT ENGINEERING
CONSUMPTION OF COTTON YARN BY SINFRA MACHINES
FIDELITY MACHINE CO.
PHILADELPHIA PA
TRACED ..... DATE 9-11-44
DRAWN R. HARBECK SCALE .....
CHECKED .....
APPROVED .....
ISSUED .....

Plate V. Shows formulas developed for use in determining consumption of yarn by Sinfra machine on weatherproof wire. ✦ ✦

Design Considerations For Square or Rectangular Wire Helical Springs

By A. M. Wahl,
Mechanics Dept., Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

ABSTRACT

Considerations involved in the design of helical tension or compression springs made of square or rectangular wire are discussed, with particular reference to the effect of curvature on stress and deflection. It is of interest to note that, for rectangular-bar springs coiled flatwise and having small indexes, the error involved by neglecting curvature in calculating deflections may be quite appreciable. The use of square or rectangular bar springs appears to be of advantage where space limitations are of prime importance since, other things being equal, the rectangular bar section will allow for higher energy storage within a given space than the use of a round bar section. ✦ ✦ ✦ ✦ ✦ ✦

IN many spring applications where maximum energy storage is desired, the use of square and rectangular wire helical springs is of advantage. One reason for this is that more material can be utilized within a given space if a square or rectangular wire section is used instead of a round section. Although for elastic conditions, the rectangular or square section does not usually have as favorable a stress-distribution as the round section, for static loading or loads repeated only a few times this disadvantage is of no importance. Thus for example, a square-bar compression spring will theoretically be able to carry about 27% more load before complete yielding over the entire section occurs, as compared to a round-bar spring having the same outside diameter and a bar diameter equal to the size of the square section. If fatigue or repeated loading is present, however, this non-uniformity of stress distribution for the rectangular section will be a disadvantage.

✦ ✦ ✦

A FURTHER advantage of the rectangular cross-section in some cases is that by this means a more nearly linear load-deflection characteristic can be obtained. (1)** Examples of the use of such springs in a testing machine application are shown in Fig. 1.

✦ ✦ ✦

METHODS of calculating stress and deflection in square and rectangular bar springs for elastic conditions will first be discussed, and the effects of bar curvature will be considered. Later consideration will be given to the effects of plastic deformation and the application of the formulas in design. It should be noted that the effect of curvature is sometimes important in design when calculating deflection of rectangular bar springs coiled flatwise. For the smaller indexes the error due to neglecting such effects may approach 15 or 20%.

✦ ✦ ✦

Calculation of Stress and Deflection—Curvature Neglected

FOR the usual spring application where the pitch angle is not too great and the index (ratio between mean coil diameter and radial thickness of wire cross-section) is not too small, the effects of curvature may be neglected and the spring may be considered essentially as a straight bar of rectangular section under a torsion moment Pr (Fig. 2) equal to load P times mean coil radius r. To calculate the torsional deflection and stress for a straight bar under torsion the so-called **Prandtl** or "membrane analogy" may be used (2). This analogy may be briefly described as follows: Assume a stretched membrane having a rectangular shape. This membrane is subject to a uniform tension at its edges, combined with a uniform lateral pressure causing it to bulge out. The "membrane analogy" states that the maximum slope of the membrane at any point represents the shearing stress at the corresponding point in the twisted bar, and that twice the volume enclosed within the membrane and the plane of its edges represents the applied torque. The problem then reduces to the calculation of the deflection and slope of a stretched membrane of rectangular cross-section. On this basis the following formulas for stress and deflection in a rectangular bar spring (curvature neglected) are obtained.

Deflection δ_o is:

$$\delta_o = \frac{2\pi \, Pr^3 n}{k_1 \, b \, a^3 \, G} \qquad (1)$$

Maximum shear stress τ_o is:

$$\tau_o = \frac{Pr}{k_2 \, b \, a^2} \qquad (2)$$

✦ ✦ ✦

In these

P = load on spring

r = mean coil radius (Fig. 2)

b = long side of cross-section (Fig. 2)

a = short side (thickness) of cross-section

n = number of active coils

G = modulus of rigidity

k_1 and k_2 are factors, depending

on ratio b/a, which may be taken from Table I.

TABLE I

b/a	k_1	k_2
1.	.1406	.208
1.2	.166	.219
1.5	.196	.231
2.	.229	.246
2.5	.249	.258
3.	.263	.267
4.	.281	.282
5.	.291	.291
10	.312	.312
∞	.333	.333

FOR **square-wire** springs where a = b, these formulas, which neglect curvature effects, reduce to:

$$\delta_o = \frac{44.6\,Pr^3n}{Ga^4} \qquad (3)$$

$$\tau_o = \frac{4.8\,Pr}{a^3} \qquad (4)$$

✦ ✦ ✦

MORE accurate calculations based on elastic theory (3) show that for **square** wire springs with indexes greater than four, Equation 3 for deflection is accurate within about 2%. For rectangular bar springs coiled flatwise the error in Equation 1 may be considerably greater as discussed below.

✦ ✦ ✦

Square-Wire Helical Springs — Effect of Curvature

A THEORETICALLY more accurate expression for calculating deflections in square wire springs having small indexes is

$$\delta = \delta_o / C_r \qquad (5)$$

where $$C_r = \frac{c^2 - .69}{c^2 - 1} \qquad (5a)$$

and δ_o is given by Equation 3.

✦ ✦ ✦

THE rate correction factor C_r depends on the spring index 2 r/a and may, for **square** wire, be taken from the lower curve of Fig. 3. As indicated previously for indexes over 4, this factor is negligible for practical purposes. For an index of 3 an error of about 4% is made by using Equation 3 which neglects curvature effects.

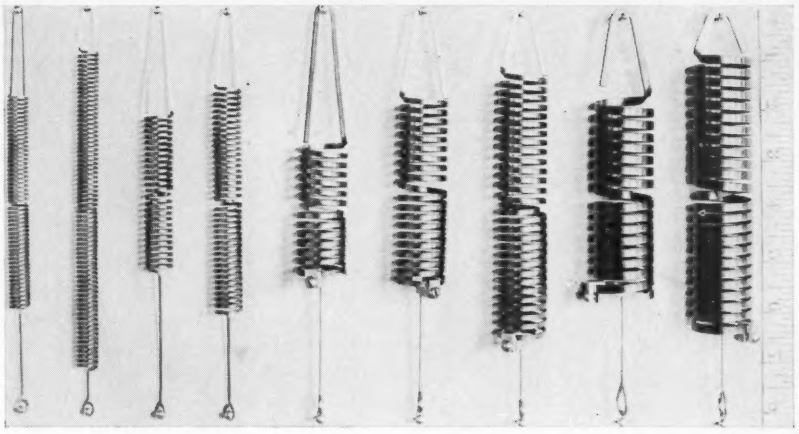

Fig. 1. Set of interchangeable rectangular bar springs made for a testing machine. (Courtesy of John Chatillon & Sons)

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TO calculate the peak stress in a **square** wire spring assuming elastic conditions with curvature considered, the stress given by Equation 4 should be multiplied by a curvature correction factor K^1 which is obtained from elastic theory (3). For small pitch angles and for indexes c greater than about 3, the factor K^1 may be taken as:

$$K^1 = 1 + \frac{1.2}{c} + \frac{.56}{c^2} + \frac{.5}{c^3} \qquad (6)$$

✦ ✦ ✦

THUS the peak torsion stress for **square wire** springs (curvature considered) becomes

$$\tau_{max} = K^1 \frac{4.8\,Pr}{a^3} \qquad (7)$$

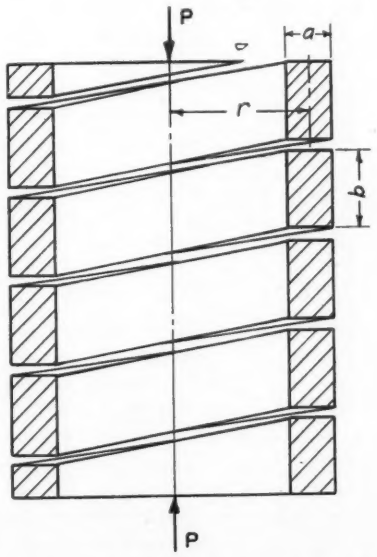

Fig. 2. Helical Spring of Rectangular Wire Axially Loaded.

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VALUES of K^1 are plotted as functions of spring index 2 r/a in Fig. 4. Comparison of this figure with the corresponding curve for round wire (4) shows that the values of K^1 are somewhat under the curvature correction values for round wire. the difference being about 7% for an index of 3, and 4% for an index of 4.

✦ ✦ ✦

IN general when a square wire spring is wound, as a consequence of plastic deformation during coiling the section becomes trapezoidal as indicated in Fig. 5. In such cases an approximation may be had by taking an average value of a equal to

$$a = \frac{b_1 + b_2 + 2a_1}{4}$$

and taking the spring index equal to 2 r/a_1 for finding K^1. Stress measurements made on square wire springs, p. 220 of reference (4) indicate this method is sufficiently accurate.

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SPRING charts for determining load and deflection of round-wire helical springs may also be used for an approximate calculation of loads and deflections in

*This paper is based on Chapter XII of the writer's book "Mechanical Springs", published by Penton Publishing Co., Cleveland, 1944.

**Numbers in parenthesis refer to bibliography at end of article.

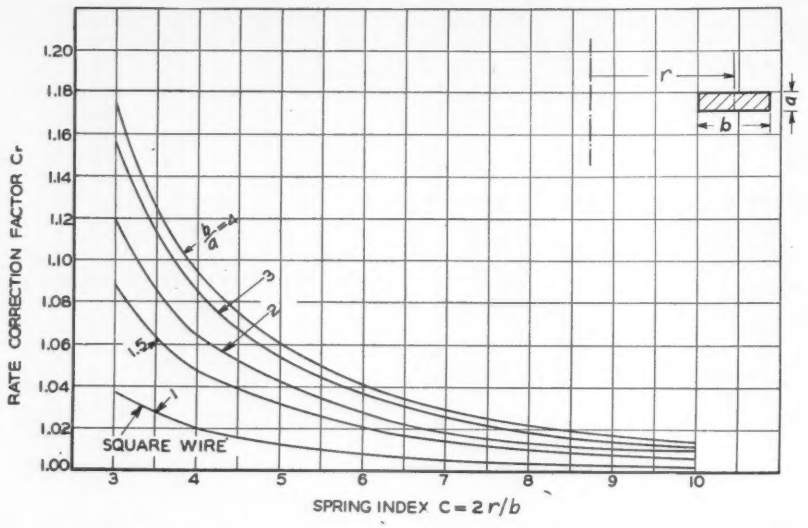

Fig. 3. Effect of Curvature on Rate—Rectangular Bar Springs (Coiled Flatwise) (Based on Formulas by Göhner VDI 1932 p. 269)

✦ ✦ ✦ ✦ ✦ ✦ ✦

square wire springs at given stresses. It is merely necessary to calculate the load and deflection at the given working stress in the corresponding round wire spring i.e. one having the same outside coil diameter, number of turns and a wire diameter equal to the average side of the square cross-section. The loads thus found are multiplied by the factor 1.06 and the deflections by .738 to find those for the square wire spring at the given stress.

✦ ✦ ✦

Calculation of Deflection of Square Wire Springs with Large Pitch Angle

THE previous formulas have been based on the assumption of small pitch angles and are usually sufficiently accurate. Where greater accuracy is desired a more exact expression for calculating deflection of square wire springs may be derived (3). This gives an expression for deflection equal to:

$$\delta = \psi \, \delta_o \qquad (8)$$

where δ_o = deflection of square wire spring figured from the usual formula (equation 3)

$$\psi = \frac{\cos \alpha}{1 + \dfrac{.31 \cos^4 \alpha}{c^2 - 1}} + .65 \sin \alpha \tan \alpha \qquad (9)$$

where $c = 2\,r/a$ = index and α = pitch angle.

EXCEPT for very large pitch angles the value of the factor ψ will not differ much from unity. For example, if $c = 3$ and pitch angle $\alpha = 10°$, the calculated value of ψ from Equation 9 is .97, which means that the deflection will be about 3% lower than that calculated from Equation 3 by neglecting the pitch angle and curvature effect. For most practical purposes where α is less than 10° and c is over three, Equation 3 is sufficiently accurate.

Calculation of Deflection of Rectangular Wire Springs — Curvature Effects Included

TO calculate deflection of rectangular bar springs, if the spring is coiled with the long side of the section parallel to the spring axis as in Fig. 2, for indexes greater than about 3, the usual formula (Equation 1) may be used with not more than a few per cent error. For greater accuracy the charts given in reference (4) page 217 may be used.

✦ ✦ ✦

WHERE the spring is coiled flatwise as in Figure 6, a more accurate formula based on elastic theory (3) for calculating deflection is

$$\delta = \frac{\delta_o}{C_r} \qquad (10)$$

where the rate correction factor C_r depends on the index $2\,r/b$ and on the ratio b/a between the long and short sides of the section and δ_o is the deflection given by Equation 1. Values of C_r for various ratios of b/a are plotted in Fig. 3 as a function of spring index. From Equation 10 it may be seen that the spring will be somewhat stiffer than indicated from the formula of Equation 1 which was derived by neglecting curvature effects.

(Please turn to Page 866)

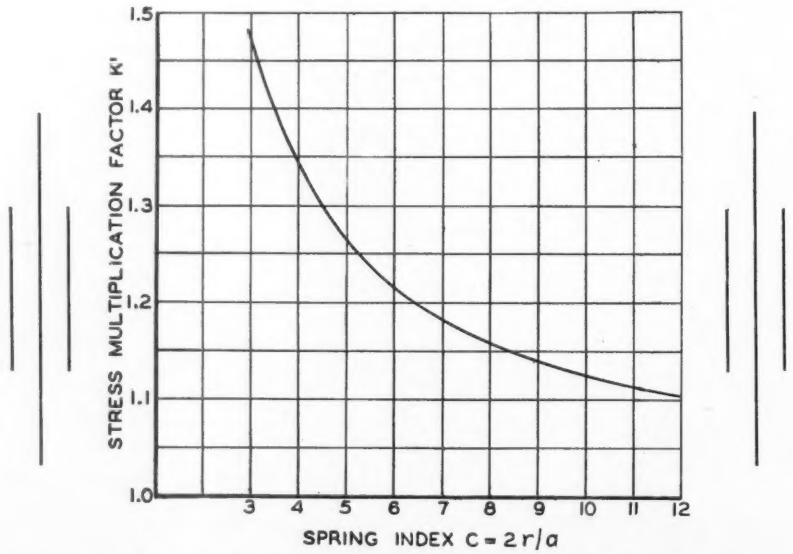

Fig. 4. Stress Multiplication Factor K' for Square Wire Helical Springs.

Wire In Combat

By Captain Roger C. Heimer,
United States Coast Guard.

An address given at the Annual Luncheon of the Wire Association at Pittsburgh, Pa., October 18, 1944. ✦ ✦ ✦ ✦ ✦ ✦

IT is a great pleasure to stand before those who build for war, and who will build for peace. You have succeeded in doing the impossible in this war; perhaps you will do the impossible in building for future America.

✦ ✦ ✦

BUT today we are at war, and that's what I came to talk about. "Wire in Combat." Now I could tell you of wire in general in this war, but you know all about that. So I'll tell you about wire and about my ship, the combat transport SAMUEL CHASE.

✦ ✦ ✦

WE departed from New York in September, 1942, loaded with an army combat team and with all the paraphernalia of war. This was our shake-down cruise, and at the same time the first run of invasion. However, we did not know that at the time. We proceeded to the north of Ireland in a large convoy. Incidentally, the people who read about convoys know little about them. Yet, a large convoy at sea is one of the most majestic sights of this war. Imagine 30 or 40 fifteen to twenty thousand ton ships, closely packed together, all proceeding in the same direction, and then, without warning, without signal, and without confusion, they all change course slowly together i.e. zig-zag. Ships zig-zag for safety against submarines, and when submarines are thick they also zig-zag at night.

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IMAGINE yourself on a huge ship, and ahead of you and astern, and on either side, within a few hundred yards, there are four other big ships. Everything is dark, and were you to come up on deck at night you would see nothing until your eyes became accustomed to the darkness, then you would see a sort of blurb on the horizon, and nothing more. Yet these convoys continue zig-zagging at night and relatively hold position. It is one of the amazing things that this can be done so successfully.

CAPTAIN ROGER C. HEIMER, U.S.C.G.
Commanding Officer,
St. Louis Coast Guard District

Captain Roger C. Heimer, commanding officer of the St. Louis Coast Guard District and former captain of the famed assault transport "USS Samuel Chase", guest speaker at the Wire Association luncheon in Pittsburgh, October 18. Regarded as one of the nation's foremost authorities on amphibious operations, Captain Heimer saw action in World War I aboard a Coast Guard cutter, following graduation from the Coast Guard Academy at New London, Conn. Recipient of the Legion of Merit and Gold Star for heroic action in the invasions of Sicily and Salerno. Captain Heimer is now responsible for more than 6,500 miles of navigable inland waterways stretching from the Canadian border to Baton Rouge, La., and from eastern Pennsylvania to Oklahoma. He came inland last February after leading the "Chase" through 20 months of deadliest warfare. Under his command, the ship was the only American naval transport to take part in the "big three" Mediterranean invasions, North Africa, Sicily and Salerno; and in spite of the severity of each operation not one member of the crew was killed. Captain Heimer will shortly return to sea duty as Commanding Officer of a huge new transport ship which he was selected to command because of his excellent record in the present war.

AFTER a brief training period, the ships sailed forth for North Africa. Now, many people read in the papers there was one huge convoy for the invasion zone. This is not correct. There were many convoys, the slower ones leaving first and the faster ones later. We did not sail the most direct line for the Mediterranean. We sailed on a long sweep as a diversionary run. It is believed that perhaps this is what gave the Germans the idea that the convoy was proceeding to Dakar. Now one of the other unusual things about this invasion was the fact that the faster convoys overtook the slower and passed them in the night without accidents or collisions of any kind. As a matter of fact, one convoy passed another in the Straits of Gibraltar.

✦ ✦ ✦

FROM a standpoint of the public, invasions are high-lighted by extreme action only at the time of hitting the beach, and immediately thereafter. The public does not know the intense amount of work and planning required prior to the invasion. Several days after sailing, the Commanding Officer or the flag officer indicates the time and place of invasion. From then on, the ship is one beehive of activity. Coxswains of the small invasion boats, and there were more than 20 of these on the SAMUEL CHASE, are grouped together studying papier-mache relief maps so that they will be familiar with the contour of the beach and background behind the beach. They study pictures made at 500 yards and 1000 yards offshore; pictures made in semi-darkness so that they will know exactly what to look for as they

approach the beach, what buildings are there, what cliffs are behind them, and what other obstacles must be overcome. And on the SAMUEL CHASE, too, due to the efforts of the Navigator, we had star charts made up for each half hour on the actual night of invasion so that each Coxswain could memorize the appearance of the stars for the important periods, and the stars which he selected for the run to his portion of the beach to serve as a guide. So successful was this that every boat hit the exact mark and landed its troops at the correct time.

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THE SAMUEL CHASE was one of four American transports to be included in the British force which made the invasion in the Mediterranean. And, incidentally, what is not known is that in the Mediterranean it was a British show primarily. The American show was at Casablanca and on the Atlantic Coast. As we proceeded to the eastward on the night of November 7th, we could see the glare of the lights of the City of Algiers. That was the last time the lights were to be lit for a period of over a year and a half. This indicated quite clearly that the Germans and the Vichy French did not expect us, and arriving at a point off the beach we lowered our boats at the proper signals simultaneously.

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HERE, incidentally, is an example of the staunchness of our equipment in view of the fact that all of the booms and davit motors were needed at the same time to put the boats over the side. Imagine the load on the 300 K.W. generators! But the motors and generators were American products, and the wire most certainly was produced by a mill represented by one of you. Then, a boat in the davits — a slow moving rig in which the 20,000 lbs. load is held by 4 5/8" wires — descends to hit the water. The descent is stopped, but a six-foot wave drops out from under the boat and it comes up with a jerk. Visualize the momentary strain at such a time, but the products of the plow steel fabricators were built to stand such a task. Not once did we have the wire break, either in practice or actual invasion.

✦ ✦ ✦

AFTER the 36-foot boats were assembled in the water, they received their signals to proceed. They proceeded to the beach each with 30 to 40 army men in what is known as waves. A wave consists of 6 to 8 boats and they proceed in a V formation so that the leading boat may signal to those following. Upon approaching the beach, about 1000 yards away, they assume the formation of a straight line, each boat being far enough from its neighbor so that **one shell** will not disable two. And from this point, 1000 yards off the beach, they open the engines wide so as to go through machine gun fire rapidly and hit the beach at full speed, their momentum being stopped by the bow rising out of the water. The ramps are lowered and the troops dash forth onto the beach.

✦ ✦ ✦

AT Ain Taya the landing was unopposed, but as we moved in, the guns of Fort Matifou, only a few miles away, were vigorously answering the British cruisers and destroyers. Not once were we fired upon by this fort, and were quite satisfied to let well enough alone. The "SAMUEL CHASE" was the farthest east of the entire invasion force. That meant we were handiest to the enemy!

✦ ✦ ✦

DAWN brought swarms of JU88's, German planes, from, we presumed, Sardinia. They dropped bombs, attempted to strafe the ships, but did not succeed. However, they did succeed in shooting down the antenna, which was quickly restored by the energy of our seagoing linemen. Naturally our men were constantly at battle stations, and it may interest you to know that for the purpose of fiighting there were over 100 telephones on various circuits — circuits to the individual guns, circuits which can be hooked together to speak to the 20 mms. as a group, or to the 40 mms. as a group; telephones for damage control so that if the ship is hit the Damage Control Officer may assemble his forces and speedily cope with the damage so that water will not pour in and sink the ship. This same Damage Control System is also used by the Fire Marshal, whose duty it is to fight fires. There is a telephone at each CO2 control station, and at each important chemical station. Also on the ship there was an operational telephone circuit, and then, of course, for customary day by day use there are the 25 dial phones.

✦ ✦ ✦

THE ship, however, continued to unload its paraphernalia of war, which had been loaded so that it would come out in the proper sequence. Among the first items to be placed ashore are bulldozers and roadmaking equipment. These big bulldozers, weighing 8 tons, are lowered on a hoist. They are put into a boat in which the clearance is a matter of 8 inches on either side. That is exactly like trying to thread a needle while doing a dance because the boat was jumping and bobbing around in the rather rough water encountered at that time, and the weather was getting increasingly bad. The bulldozer would be landed in the bottom of the boat, but before the hoist could be slacked, the boat would drop out from under the bulldozer and the rig would take such a terrific shock that the mast would seem to dance around on deck and the whole ship would be made to vibrate. The American wire products were built for this, apparently, because I don't know of any failure to have happened on any of the 4 transports in our group.

✦ ✦ ✦

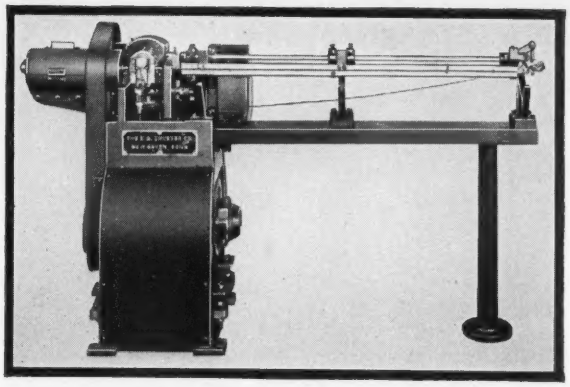
FROM our holds there poured a steady stream of tanks, ambulances, self-propelled guns, anti-aircraft guns, jeeps, and big trucks, loaded for combat. And, incidentally, being loaded for combat means these trucks had on

board ammunition, spare gasoline, camouflage material, some food for the crew, spare parts, and all the other things necessary for the immediate attack on the beach. Then, we had on board 250 tons of ammunition, 20,000 gallons of gasoline in 5-gallon containers, hundreds of tons of food, 10,000 gallons of water in 5-gallon containers. Even during the time bombs were screeching toward us, and while our guns were answering the attack, the unloading continued, directed, when things got too noisy, by 76 Public Address speakers placed all over the ship, and, incidentally, we also attempted to keep the boys down below, who had the task of keeping the machinery going, informed as to the outcome. Wire carried that welcome information.

✦ ✦ ✦

WE were also attacked by torpedo planes, and one clever attack was that in which a torpedo plane released 2 torpedoes almost simultaneously, one passing within 3 feet of the bow, and the other within 20 yards of the stern. On the 2nd day, the ship moved to Algiers Bay; even though we presumed the area might have been mined, we trusted that our degaussing would stand off any magnetic mines. Incidentally, in this degaussing there are tons and tons of wire used — in fact, cable goes around the ship 6 times, being 2 inches in diameter and a multi-wired affair. It is for the purpose of counteracting the natural magnetism of the ship. We continued to unload, but at sunset, anticipating an attack, the "SAMUEL CHASE" got underway, very fortunately, and was immediately attacked by German planes. We had been unloading alone, and were on our own. For this reason, we were singled out for an attack. It had been said that the violent maneuvering through which I put the ship saved her. At least we evaded 5 torpedoes during this run.

(Please turn to Page 864)



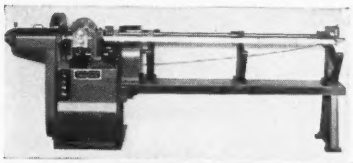
SHUSTER WIRE STRAIGHTENER TYPE A
Wire Capacity 1/32" - 1/16" Diameter

Faster Cutting Speeds
GREATER PRODUCTION!

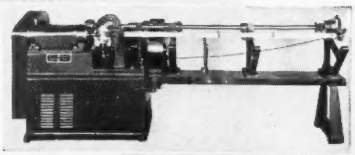
✦

Outstanding Features —

Almost continuous wire travel
Lightning cut-off assures square-cut ends
High speed, direct driven 5-die straightening flier
Quiet, highly efficient V-belt motor drive
Ball and roller bearings throughout
Extremely rigid construction
Fully guaranteed as to material and workmanship.
Further details on request.



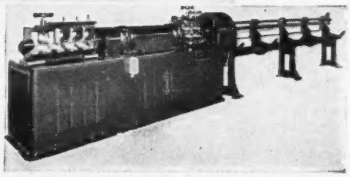
Type 1A
$\frac{1}{16}$" - $\frac{3}{16}$" Dia.



Type 2A
$\frac{1}{8}$" - $\frac{1}{4}$" Dia.

Type 3A
$\frac{3}{16}$" - $\frac{3}{8}$" Dia.

Type 4A (not shown)
$\frac{3}{8}$" - $\frac{5}{8}$" Dia.



The F. B. Shuster Mfg. Co., Inc., New Haven, Conn.

SHUSTER
Automatic
WIRE STRAIGHTENING
AND CUTTING
MACHINES
Since 1866

✦ GOVERNMENT WIRE PRODUCTION INFORMATION ✦

Signal Corps Effects Savings in Strategic Materials By Use of Substitutes

SPECIFIC savings can be cited by the Signal Corps, U. S. Army in convincing support of any statement of conservation aims. America's long, successful fight to produce adequate synthetic rubber out of grain, coal and oil to offset the desperate shortage of crude rubber caused by Japan's shutting off of 93% of the world's supply is widely known, but this struggle would have been in vain had American ingenuity failed to develop immediate substitutes so that the war program could go full speed ahead. The Signal Corps saved 12,000,000 pounds of crude rubber, enough to build 150,000 automobile tires, in the first four months of 1944 through the use of substitutes. The monthly crude rubber requirements of the Signal Corps were reduced from 2,626,000 pounds in June, 1943, to about 800,000 in April, 1944, the largest saving being effected through the use of substitutes in the production of field wire and telephone cable assemblies.

✦ ✦ ✦

IN the making of Army field telephones aluminum, brass, cobalt, steel and leather are saved in thousands of tons by substitutions of zinc alloys, alnico steel and impregnated fabrics.

✦ ✦ ✦

IN developing new types of telephone headsets one company reports savings of 1,215 pounds of nickel; 8,000 pounds of stainless steel; 400,000 steel rivets; 800,000 screw machine rivets (by substituting 400,000 header rivets, which give improved performance); and the entire elimination of Japanese silk. The same company reports a monthly reduction of 22,600 man hours, due to the newly developed headsets, and figures that in order to equal the man hours saved the full daily work of 113 people would be required.

✦ ✦ ✦

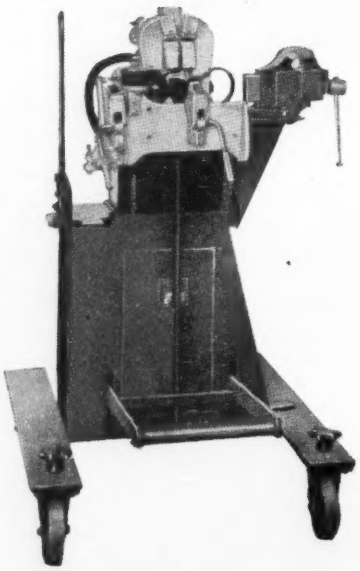
IN the manufacture of military mobile radio stations — and America makes the most powerful ones in the world—industry has learned how to do without aluminum altogether and to save thousands of tons of steel. Mica is also saved and rubber is replaced by processed animal fibre in the seat cushions of the vehicles. The higher grades of plywood have been replaced by lower grades, through aggressive development engineering.

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

Telephone, State 7468

IN the making of walkie-talkies improved instruments are produced despite the use of substitute materials. Brass is replaced by steel, mica by impregnated paper, steel by plastic, natural rubber by synthetics, aluminum by steel.

✦ ✦ ✦

International Screw Thread Standards

THE Combined Production and Resources Board reported recently that a joint mission is in London trying to find a common standard for screw threads, and is making progress.

✦ ✦ ✦

THE simple matter of screw threads has been an incalculable factor in hampering production of interchangeable parts during the war, CPRB pointed out. The board cited the pre-war difficulties encountered when a piece of British machinery, such as an automobile, broke down in America, or when American apparatus required repair in Britain. Concerning the standards conference, CPRB said:

✦ ✦ ✦

THE need for a single basic standard for screw threads in common use in place of the two separate systems which are not at present interchangeable is evident. The existence of these two systems has caused considerable difficulties in the production of items of equipment for common use in the prosecution of the war.

✦ ✦ ✦

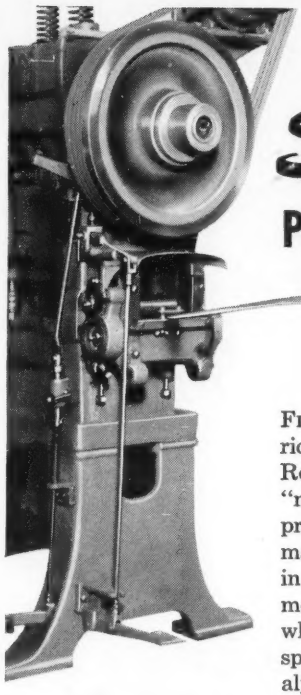
A NUMBER of specialized types of screw threads also came under review and considerable progress was made in the formulation of recommendations for common standards.

✦ ✦ ✦

Production Gauges and Precision Measuring Hand Tools

BECAUSE production of gauges and precision measuring hand tools is now considered adequate for all essential demand, suppliers may purchase these items without ratings, the War Production Board

(Please turn to Page 850)

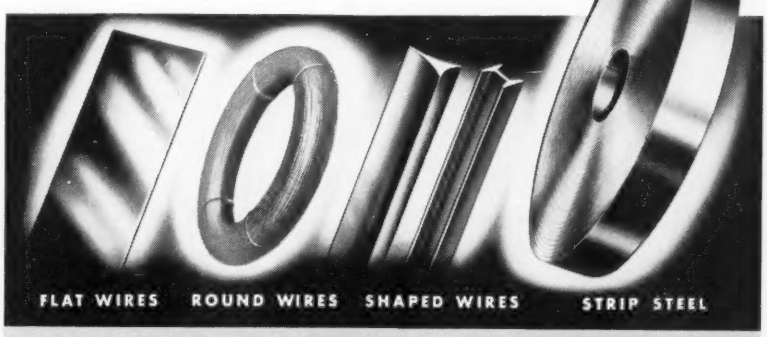


WHERE *Strip Steel* PROVES ITS METAL!

FLASHING THROUGH final fabrication in *your* plant is where Roebling Strip Steel proves its "metal"! Speedy, maximum production, minimum machine maintenance and long die life in shop after shop offer testimony to the skill and care with which Roebling follows your specifications . . . for steel analysis, dimensions and finish.

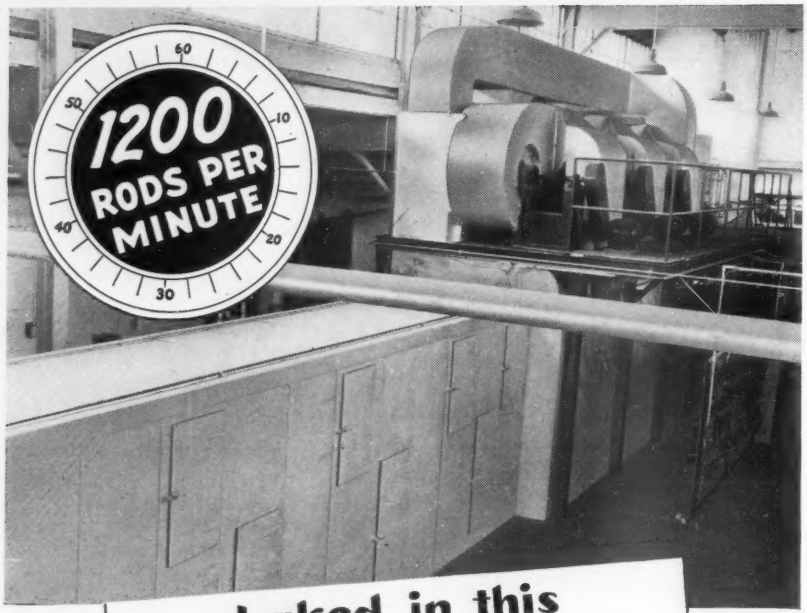
That's why if you use Strip Steel, Round, Flat or Shaped Wire . . . for forming, punching, drawing or coiling springs . . . you can depend on "Roebling"—and the experience sharpened know-how we've accumulated in over 100 years of *wire specialization!* We have the facilities and the manpower to help you lick your current production problems—and help you get set for tough, post-war, competitive marketing!

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities



ROEBLING
PACEMAKER IN WIRE PRODUCTS

WIRE ROPE AND STRAND • FITTINGS • SLINGS • SUSPENSION BRIDGES AND CABLES
COLD ROLLED STRIP • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS
AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • AERIAL WIRE ROPE SYSTEMS • ROUND AND SHAPED WIRE • ELECTRICAL WIRES AND CABLES • WIRE CLOTH AND NETTING



baked in this
ROSS
"UNIVERSAL"
WELDING ROD
OVEN

ROSS Multiple Pass, Zone Controlled, Chain Conveyor Ovens not only maintain high quantity of output but produce hard, firm, dry coated rods of finer quality. These modern ovens are designed to handle the rods so as to protect the coatings while they are soft. Zone conditions of temperature, humidity and speed can be varied according to type of rod handled. ROSS "UNIVERSAL" Welding Rod Ovens are designed to meet your production requirements — to insure you against chipped or broken coatings.

The ROSS Testing Laboratory, one of the finest in America, is available for correctly determining proper baking conditions for your particular product. A ROSS engineer can put its facilities at your service—without obligation.

ROSS SYSTEMS

J.O.ROSS
ENGINEERING CORP.

350 MADISON AVE., New York 17, N. Y.

CHICAGO 6—201 N. Wells St. DETROIT 3—12953 Greeley Ave.
BOSTON 9, MASS.—79 Milk Street
ROSS ENGINEERING OF CANADA LTD.—Dominion Sq., Bldg., Montreal

Government Wire Production Information

(Continued from Page 849)

said today. For these goods, the use of WPB Form 547 (Distributors' Application for Preference Rating) has been discontinued.

✦ ✦ ✦

ORDER E-5-A, which required that manufacturers of gauges and precision measuring hand tools restrict shipments to rated orders, has been revoked. Supply is now large enough to make normal purchasing possible, therefore manufacturers need no longer set aside a percentage of production for jobbers and dealers, WPB said.

✦ ✦ ✦

Plastic Screen Protects Soldiers in Tropics

THE plastic named saran has been found to have excellent characteristics as screen and is used widely to protect soldiers against disease-carrying tropical insects. Tensile strength is as high as 50,000 lbs. per square inch. The plastic, when securely framed, is more than six times as strong as conventional metal screen. Plastic is immune to corrosion, dampness, mildew and tropical heat, and retains great strength at —30°F. Same material is used as insole for jungle boots and helps soldiers avoid such diseases as athletes foot, Dohbie itch, Singapore foot and Tinea.

✦ ✦ ✦

Balloffet Wins Second Army-Navy "E"

THE **Balloffet Dies and Nozzle Co.**, of Guttenberg, N. J., has won for the second time the Army-Navy Production Award for "meritorious services on the production front," and are now entitled to add a white star to their "E" pennant. This announcement was made in a letter received from the Under Secretary of War, praising the achievement.

✦ ✦ ✦

THE company states in this connection: "We become the only Diamond Die firm in America having won twice the Production Award and naturally we are very proud of this distinction."

Idea for Prepacking Tubes for Cables Wins Navy Award

James T. Wong, son of a Chinese miner, has received a $3,800 award for a suggestion which developed a time-saving method of prepacking bulkhead electric cable stuffing tubes at the Mare Island, Calif., Navy Yard.

✦ ✦ ✦

MR. Wong, a Mare Island electrician, hit upon his prepacking idea in correcting a mistake of another employee. As he pulled the cable out of the tube he noticed that the packing clung to it, coming out in one piece. A hand-powered machine was rigged up to make the packing "doughnut" and later a faster machine was manufactured. Previously the packing was stuffed in after the cable had been drawn through the tube.

✦ ✦ ✦

New Wire-Coating Method Saves Tin

A NEW high-speed method for coating copper electrical wire with tin, requiring only one half as much tin as by the older hot-dip method, was demonstrated publicly for the first time at the National Metals Exposition.

✦ ✦ ✦

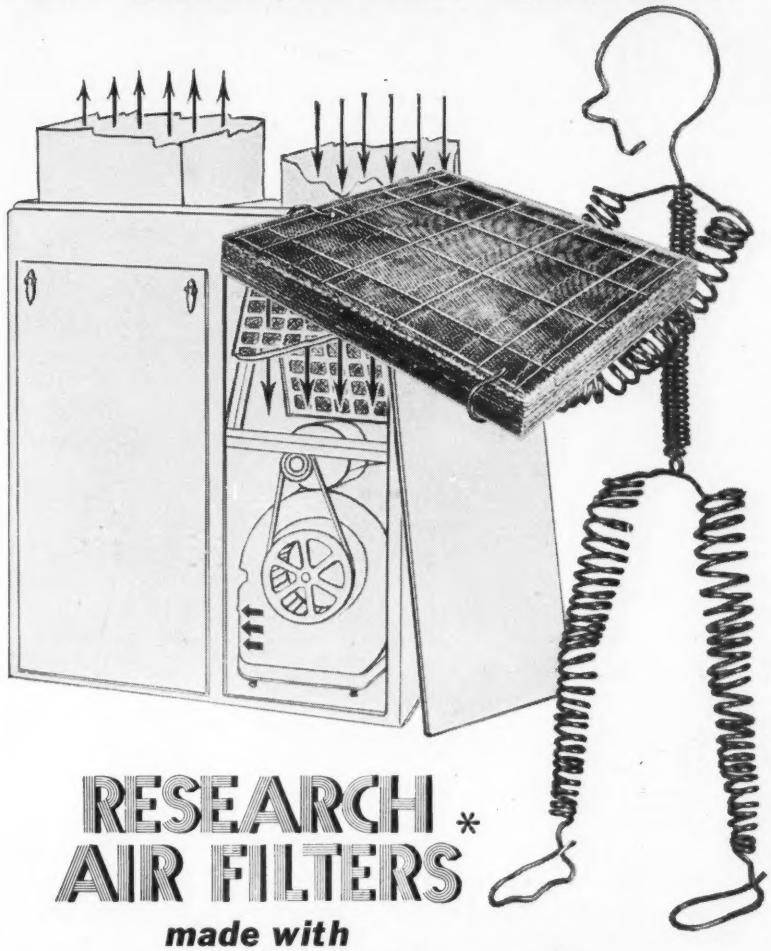
ELECTRICAL wire ranging in sizes from those about as fine as a human hair on up to heavy gauges can be coated in the apparatus. Wire only five-one-thousandths of an inch thick can be given its new tin coat at the rate of 800 feet per minute, without breakage, and heavier strands may be put through at even higher speeds.

✦ ✦ ✦

THE wire-plating machine, which is thirty feet long, was designed and constructed by the National-Standard Company of Niles, Mich., to utilize the DuPont Halogen Tin Plating process.

(Please turn to Page 852)

Cleaner Air
in Factories and Homes...



RESEARCH * AIR FILTERS
made with
KEYSTONE Wire

Research Air Filters, the grids of which are made from Keystone wire, are helping guard the health of millions in war plants, factories, office buildings, theatres and homes. These efficient, economical filters remove more than 90% of all dust, dirt and lint from the air. Result . . . lung infections and diseases are greatly reduced . . . manufacturing processes are improved.

We are indeed proud that Keystone wire used in this way is helping contribute immeasurably to the health and productive capacity of the nation.

*Research Products Corp., Madison 3, Wisconsin

KEYSTONE STEEL & WIRE CO., Peoria 7, Illinois

Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE
REG. U.S. PAT. OFF.
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Coppered, Tinned, Annealed, Galvanized

Government Wire Production Information

(Continued from Page 851)

COPPER wire which is to be insulated with natural or synthetic rubber — and miles of it are used in the electrical industry — must be coated with tin for protection and other reasons before application of the insulation. Heretofore, when tin has been used for this purpose it has been applied in the molten form, in the so-called hot-dip process. This method picks up more tin than is necessary and the heat forms a copper-tin alloy on the wire, which increases its electrical resistivity and reduces its elongation properties.

✦ ✦ ✦

THE electrolytic process deposits the tin without producing an alloy and therefore does not affect the resistivity or elongation. Unlike the hot molten bath which must be periodically purified, at the expense of time and tin, the electrolytic bath does not become contaminated with copper.

✦ ✦ ✦

THE plating apparatus is ingeniously arranged so that there is a minimum of tension and drag on the wire. In fact the wire zips in and out of as many as seven bathtubs of cleaning and plating solutions without touching the rim of any of the tubs. It emerges from the baths with its smooth new coat of tin untouched by any metal or other solid material and therefore unscratched.

✦ ✦ ✦

THIS "dainty dip" is achieved by keeping the baths "heaping full" and running over (recirculation saves the fluid). They are so placed that the wire passes through the heaped up part, the so-called inverted meniscus, just missing the rim of the vessels in each case. Instead of having a wiping mechanism to remove excess fluid between the baths, this is done by compressed air blasts. These arrangements not only subject the wires to a minimum of handling but facilitate stringing them up for the start of a plating run. They are simply laid over the top of the baths, and attached to "let-off" and "take-up" spools at the two ends of the apparatus.

✦ ✦ ✦

Announcing the Norton Vitrified Bonded Diamond Wheel

THE development of a vitrified bonded diamond wheel is announced by **Norton Company**, Worcester, Mass. This new wheel supplements the resinoid bonded diamond wheel introduced to industry by Norton in 1934 and the metal bonded diamond wheel which they introduced in 1939. These three types of diamond wheels make it possible to meet the requirements of all kinds of carbide tool grinding as well as the grinding of glass, quartz crystals, porcelain and similar materials.

(Please turn to Page 860)

2 BX Mossberg Carrier

MOSSPEED BRAIDER CARRIERS

Represent

Improved Braiding at Lower Costs

The patented MOSSPEED spring tension take-up makes it possible to increase the speed of the maypole-type braiding machine. An effective increase of 80% being obtained in many cases.

The new (x) type MOSSPEED high speed carrier permits the rapid changing of tension springs making this an ideal carrier for braiding all kinds of yarn (cotton, rayon, asbestos, jute), in addition to fine strands of copper wire.

Consult our engineers regarding your braiding problems.

2 SE Copholder

Complete line of both MOSSPEED carriers and metal copholders for all sizes and makes of maypole type braiding machines.

MOSSBERG
Pressed Steel Corp.

18 West Street

Attleboro, Massachusetts, U. S. A.

Ross Whitehead & Co., Ltd., Montreal and Toronto, Canada.

James Day (Machinery), Ltd., "Ford House," 88 Regent Street, London, W. I., England.

A Review of Recent Wire Patents

No. 2,359,532, APPARATUS FOR APPLYING INSULATING TUBING ON WIRE CABLES, CONDUITS, AND THE LIKE, patented October 3, 1944 by Marshall O. Searle, Beverly Hills, Calif.

The tubing is temporarily expanded and the wire, having a detachable guiding tip, is drawn therethrough.

✦ ✦ ✦

No. 2,359,568, APPARATUS FOR CLEANING STRANDS, patented October 3, 1944 by Alexander Logan, Dundalk, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Rotating fabric-covered discs contact the moving wire while passing through the cleaning liquid chamber.

✦ ✦ ✦

No. 2,359,590, ELECTRIC CONDUCTOR AND A METHOD OF MAKING IT, patented October 3, 1944 by Charles C. Smith, Cranford, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

About the wire conductor are two sewings of rayon, then a cotton sewing and an outer covering of cellulose acetate.

✦ ✦ ✦

No. 2,359,993, WIRE TREATING METHOD, patented October 10, by Walter L. Keene, Dormont, Pa., assignor to Rustless Iron and Steel Corporation, Baltimore, Md., a corporation of Delaware.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents; outside United States and Canada, $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

In lead-coating of stainless steel wire, containing one or more of the elements molybdenum, columbium and titanium, the wire is continuously passed through a heating chamber, thence through a cooling chamber, both chambers containing a dry atmosphere of hydrogen and nitrogen, then passing the wire through an aqueous fluxing bath of hydrochloric acid and hydrofluoric acid saturated with ammonium chloride and maintained at a temperature of about 200° to 250° F., and thence into the air to dry, and thereafter passing the wire through a bath of molten lead at a temperature of 680° to 900°F.

✦ ✦ ✦

No. 2,360,003, APPARATUS FOR PRODUCING SELF-LOCKING SCREWS, patented October 10, 1944 by Charles B. McDonald, Detroit, Mich., assignor to Eaton Manufacturing Company, Cleveland, Ohio, a corporation of Ohio.

This invention covers a thread-milling hob, for simultaneously producing a pair of co-axially arranged threaded portions on a screw shank, so that the thread on one portion will be axially offset with respect to the thread on the other portion.

✦ ✦ ✦

No. 2,360,312, METHOD OF MAKING INSULATED WIRE UNITS, patented October 17, 1944 by Robert J. Aust, Indianapolis, Ind., assignor of P. R. Mallory & Co. Inc., Indianapolis, Ind., a corporation of Delaware.

The method of making insulated wire units from a length of wire insulated with a sheath formed of thermoplastic fibres, comprises heating the fibres in paths around the sheath at intervals along the length of the wire to form coalesced paths around the sheath, then cutting this wire and sheath at the paths to produce shorter lengths of wire having insulated sheaths with the free ends coalesced, and then pushing these free ends of the sheaths back to expose the ends of the shorter lengths of wire.

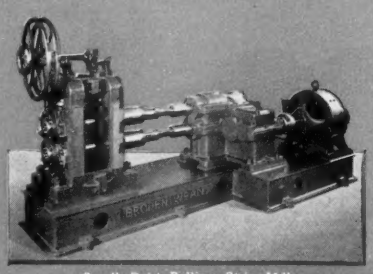
✦ ✦ ✦

No. 2,360,387, DEVICE FOR CUTTING SCREW THREADS, patented October 17, 1944 by Emil Baerwalde, Cleveland, Ohio.

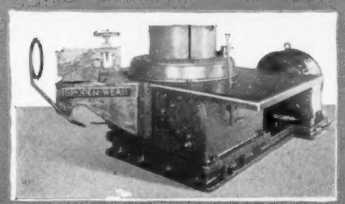
A shaft is arranged with its longitudinal axis forming an acute angle with

(Please Turn to Page 854)

WEAN-BRODEN



Small Cold Rolling Strip Mill



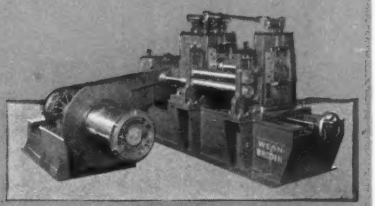
Special Alloy Single Draft Heavy Duty Vertical Wire Drawing Block for ⅝" Round Wire

THE Wean Engineering Company, Inc., have long been recognized as specialists in sheet, strip and tin mill equipment . . . The Broden Construction Company specializes in the manufacture of narrow strip and wire mill equipment.

With the extended facilities of The Broden Construction Company as a subsidiary of The Wean Engineering Company, Inc., it is now possible to serve the steel industry more effectively.

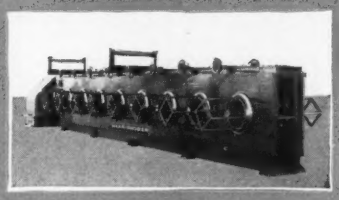
COLD ROLLING MACHINERY
For 36" Wide Material and Narrower
Mills • Reels • Slitters • Levelers • Coilers
Edgers • Scale Breakers • Shears
Scrap Ballers • Continuous Pickling

WIRE MILL EQUIPMENT
Wire Drawing Machines • Patenting
Galvanizing and Tinning Take-Up Frames
Wire Flattening • Spoolers • Nail
Galvanizing and Blueing



Strip Reel and Slitting Unit

HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY



The BRODEN CONSTRUCTION Co., Inc., Cleveland, O.
A SUBSIDIARY COMPANY OF
The WEAN ENGINEERING Co., Inc., Warren, O.

Patents

(Continued from page 853)

the work and carrying thread cutters at its forward end. The thread cutters are so positioned as to clear the tail stock of the machine during the cutting operation.

✦ ✦ ✦

No. 2,360,741, WIRE DISTRIBUTOR FOR WIRE-DRAWING MACHINES, patented October 17, 1944 by Daniel D. Symmes, West Haven, Conn., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

Included is a planetary unwinding arm, mounted to shift automatically from one wire-holding reel to another, responsive to directional tension of the wire.

✦ ✦ ✦

No. 2,360,746, WIRE DRAWING DIE HOLDER ASSEMBLY patented October 17, 1944 by Chandler Walker, Newton Center, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

A ball and neck assembly is provided, the neck having a hole with a counterbore in the neck for receiving the die. The end of the neck has a transverse slot extending through the counterbore and giving access to the side of the die to facilitate its removal.

✦ ✦ ✦

No. 2,360,674, PORTABLE MAT, patented October 17, 1944 by Noah S. Harter, Waukegan, Ill., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

This mat is constructed of a number of flat sections of woven wire chain link of fabric, formed of wire spirals. Means is provided for anchoring the mat in place.

✦ ✦ ✦

No. 2,360,826, SELF-LOCKING SCREW OR BOLT, patented October 24, 1944 by Andrew J. Cherry, Chicago, Ill., assignor to Economy Screw Corporation, Chicago, Ill., a corporation of Illinois.

Material displaced in turning the screw forms a holding rib disposed in a groove in the screw shank above the screw threads.

✦ ✦ ✦

No. 2,360,960, WINDING APPARATUS, patented October 24, 1944 by Frank Martindell, Western Springs, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The reel-supporting means is advanced longitudinally of a core about which the reel is rotated and this advance is turned with the drive of a take-off ring.

✦ ✦ ✦

No. 2,361,646, PINCERS FOR WIRE-DRAWING BLOCKS, patented October 31, 1944 by Thomas Noponen, Worcester, Mass.

The pincers are characterized by the novel feature of projections extended laterally from the operating arms thereof adapted to enable an operator to safely close the jaws tightly on the wire by gripping the projections and exerting finger pressure thereon.

Coloring of Metals

STEEL, copper, brass, bronze, zinc, nickel, tin, gold, silver, aluminum, magnesium and other metals and alloys may be colored, by simple processes of chemical immersion.

✦ ✦ ✦

A LONG range of colors is possible in iridescent and matte effects. Many of the coloring baths also increase the corrosion resistance of the metal being treated.

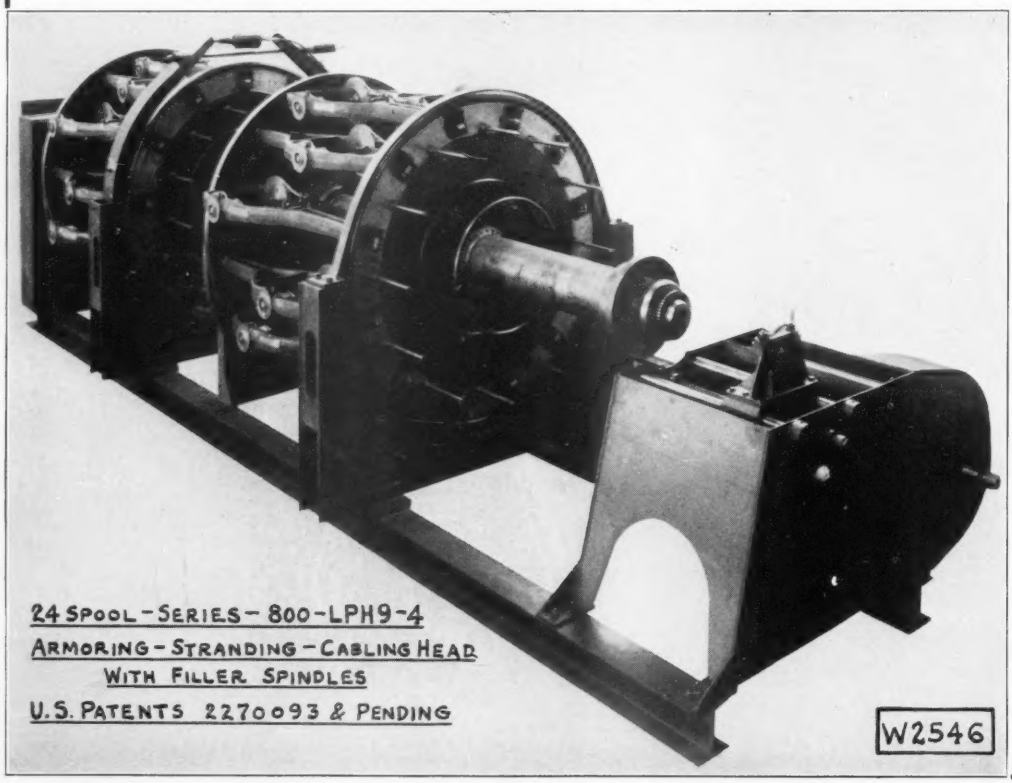
✦ ✦ ✦

COLORING salts or solutions are furnished with instructions for their use together with instructions for metal preparation and cleaning.

✦ ✦ ✦

FOR those interested it is suggested that samples of the metal to be colored be submitted, together with a sample or descrip-

THE WATSON MACHINE COMPANY
PATERSON, NEW JERSEY, U.S.A.
ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY



SERIES 800 "LPH" PLANETARY HEADS.
* * *
CRADLES:
FLAT TYPE RETRACTING PINTLE.
ANTI-SLAP INTEGRAL TENSION
1:1 RING-BACKTURN.
STAGGERED CIRCLE.
ANTI-FRICT. BEARING.
* * *
ROTOR:
ALL STEEL BALL BRG. ROLLER-SUPPORTS.
* * *
GEARING:
ALL STEEL CHANGE & REVERSE.

tion of color desired. A description of the end-use of the product is also desirable (outdoor or indoor use, type of service, etc.).

✦ ✦ ✦

INSTEAD of sending samples of salts or solutions for test, customers' metal specimens will be colored and returned for evaluation. Address inquiries to Technical Processes Division, Colonial Alloys Company, Philadelphia 29, Pa.

✦ ✦ ✦

Versatility of Plastics in the Wire Industry

BESIDES its use in the electric wire and cable industry as a dielectric coating, a number of accessory refinements in the use of Vinylite have been developed indicative of the versatility of plastics. Some of these are described below through the courtesy of the Bakelite Corporation.

Figure 1. Marked Wires.

✦ ✦

Marked Wires

TRANSPARENT wire covers carrying indelible color strips are now being used by the Armed Forces for the identification of wires. The Stria-color process, by means of which these covers are produced, makes it possible to extrude tubing with color identification lines inlaid into the surface. The color stripes are extruded from the same material as the body of the extrusion, and are as permanent as the tubing itself. For the manufacture of these Striatubes, Carter Products Corporation, 6921 Carnegie Ave., Cleveland 3, Ohio, employs a VINYLITE elastomeric compound. These tubes provide insulation which is non-flammable, non-oxidizing, and resistant to oils, greases, water, and most acids and alkalies. Their transparency simplifies visual inspection of the insulated wire. Opaque tubes, marked in the same manner, are also produced for essential uses.

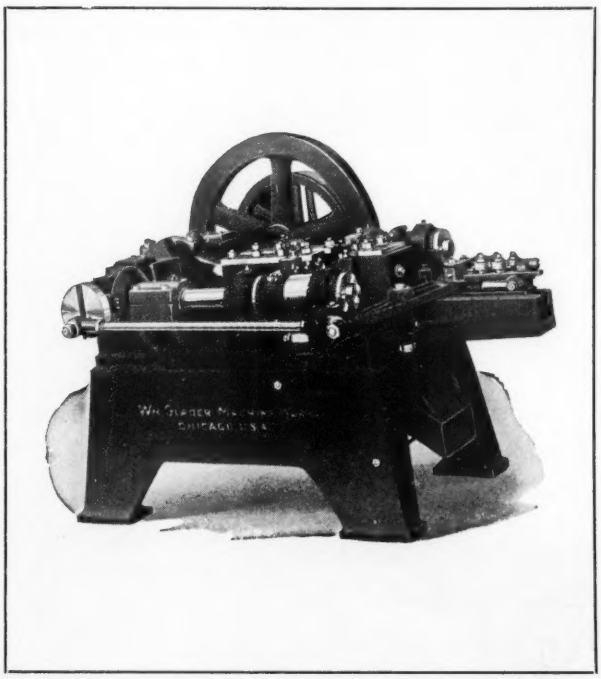
✦ ✦ ✦

Red Hot—Ground White

RED-HOT, white-ground; that's the color code that the H. B. Sherman Manufacturing Company of Battle Creek, Michigan, has

(Please turn to Page 861)

GLADER HIGH SPEED WIRE NAIL MACHINE



High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS

210 NO. RACINE AVE.
CHICAGO, ILLINOIS

Outstanding Personalities of the Wire Industry

Evelyn Carlson, Sales and Production Coordinator, Wickwire Spencer Metallurgical Corporation

WICKWIRE Spencer Metallurgical Corporation, subsidiary of the Wickwire Spencer Steel Company, announced today the appointment of **Evelyn S. Carlson** as Sales and Production Coordinator at the Company's Newark, New Jersey, plant.

✦ ✦ ✦

MISS Carlson was formerly in charge of Molybdenum Wire Allocation for the War Production Board in Washington, a position she held since 1942. Prior to her Washington post she was assistant to the Technical Director of the Sealed Power Corporation, Muskegon, Michigan, and in charge of costs and scheduling for the Thomas Foundries, Birmingham, Alabama.

✦ ✦ ✦

IN her new position with the Wickwire Spencer Metallurgical Corporation, Miss Carlson will be responsible for the coordination of production and sales of both tungsten and molybdenum wire.

✦ ✦ ✦

J. E. Brister, Manager, Vinylite Wire and Cable Compounds Div., Union Carbide and Carbon Corp.

Bakelite Corporation, Unit of Union Carbide and Carbon Corporation, announces the appointment of **J. E. Brister** as Manager of VINYLITE Wire and Cable Compounds Division, with headquarters at 30 East 42nd Street, New York 17, New York. This division will handle the servicing of all VINYLITE plastic compounds for use in conjunction with wire and cable insulation.

✦ ✦ ✦

AFTER graduation from Stevens Institute, Mr. Brister became a Service Engineer for the Bonding Materials Division of Bakelite Corporation. In 1939, he was transferred to Halowax Products Division of Union Carbide and Carbon Corporation. He is a member of The American Chemical Society.

✦ ✦ ✦

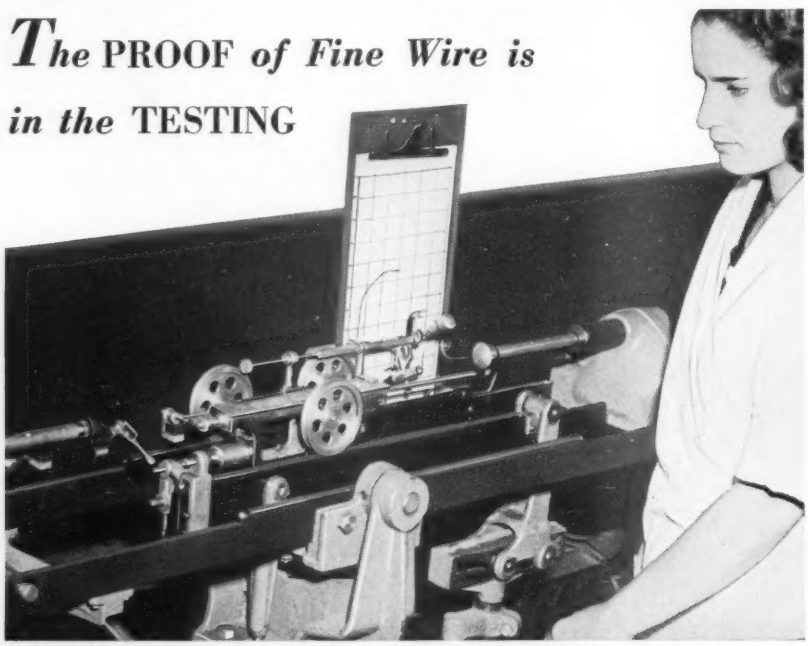
ASSOCIATED with Mr. J. E. Brister are M. M. Suba, with headquarters at Hartford, Conn., and E. R. Gazdik, with headquarters at Detroit, Michigan.

✦ ✦ ✦

S. L. Eastman, Chief Engineer, Cleveland Worm & Gear Co.

S. L. Eastman has been appointed Chief Engineer of The Cleveland Worm & Gear Company, Cleveland, Ohio, effective September 1st. Mr. Eastman has been connected with the company in

***The* PROOF *of Fine Wire is in the* TESTING**



As specialists in the drawing of fine wire of close tolerances, perfect roundness and faultless surface condition, North American Philips have set up their own exacting specification standards, meeting the most rigid customer requirements.

To maintain these standards, special test equipment is in constant use, such as the Scott Tester, illustrated, that provides a precise measure of wire elongation, yield point and tensile strength. This relentless pursuit of perfection is your guarantee of a quality product.

North American Philips manufactures fine wire below .003" diameter in silver, nickel, copper, nickel chrome and aluminum alloy — bare or enameled.

We also plate many types of wire, such as silver, tungsten, molybdenum and alloys up to .010" with gold, copper or other metals.

Many manufacturers have found our unusual skill of great value in helping them meet wartime production schedules and in developing new instruments and apparatus. North American Philips has the knowledge of processes and techniques developed by a technical organization with a background of over fifty years' experience in its fields.

Call on our specialized engineering service whenever you have a fine wire problem.

WHERE NORELCO FINE WIRES ARE USED IN THE ELECTRONICS FIELD

★ Precision wire-wound resistors. ★ Hearing Aids ★ Radio headphones ★ Sensitive recording and indicating meters ★ Sensitive relays ★ Electronic tube grids and filaments ★ Sound recording on steel wire ★ Fractional horsepower motors ★ Wire braid and cloth ★ And hundreds of other uses where very fine wire is required.

NORELCO PRODUCTS: Also diamond dies for our own drawing; Tungsten and Molybdenum products; Quartz Oscillator Plates; Amplifier, Transmitting, Rectifier and Cathode Ray Tubes; Searchray (X-ray) Equipment; X-ray Diffraction Apparatus; Medical X-ray Equipment, Tubes and Accessories; Electronic Measuring Instruments; High Frequency Heating Equipment; Communications Equipment. • When in New York, visit our Industrial Showroom

Norelco Reg. U. S. Pat. Off. *Electronic Products by* **NORTH AMERICAN PHILIPS COMPANY, INC.**

Dept. W-12, 100 East 42nd Street, New York 17, N. Y.
Factories in Dobbs Ferry, N. Y.; Mount Vernon, N. Y. (Metalix Div.); Lewiston, Me. (Elmet Div.)

various capacities since graduating from Case School of Applied Science in 1927. He was assigned first to the testing laboratory, later serving as sales engineer and assistant sales manager. Since April, 1942, he has held the position of assistant chief engineer. G. H. Acker continues as vice president in charge of engineering and production of both The Cleveland Worm & Gear Company and its affiliate, The Farval Corporation.

K. D. Smith, Manager, Worcester Wire Works

K. D. Smith has been appointed manager of the Worcester Wire Works Division of the National Standard Company, W. H. Parkin, president and general manager of the company, has announced.

✦ ✦ ✦

MR. Smith formerly was Washington representative of The B. F. Goodrich Company. Prior to his Washington assignment for the rubber company, he was assistant manager of its factory operations at Akron.

✦ ✦ ✦

George W. Palmer, who is succeeded by Smith at the Worcester Wire Works Division of National Standard Company, has been retained by the company as a consultant.

✦ ✦ ✦

Standard Varnish Works Appoints M. H. Corbin, Vice President in Charge of Sales

AT a recent meeting of the Board of Directors, **Mr. M. H. Corbin** was elected a Director of the Company and was appointed Vice President in charge of sales of both the New York and Chicago divisions.

✦ ✦ ✦

MR. Corbin has been associated with Standard Varnish Works since 1937 in a technical and sales capacity and for many years has been closely identified with the development of organic finishes for industrial applications. For the past two years he has been Manager of Industrial Sales of the New York plant.

✦ ✦ ✦

A GRADUATE chemical engineer from Lehigh University, Mr.Corbin has held various important positions in the technical and sales branches of the paint, varnish and lacquer industry. He holds several patents; and is the author of numerous technical articles on the subject of organic finishes.

(Please turn to Page 858)

Intense hardness makes TECO Cemented Carbide slow-wearing — provides greater resistance to wear and friction. Uniform, dense structure makes TECO Cemented Carbide smooth-wearing — eliminates pitting and cracking which cause costly reject runs.

Result: Longer runs — less time lost for die changes — greater tonnage per die of smoothly-finished, on-size wire.

Remember — wire production depends on die performance. Let a test run demonstrate the difference in output between TECO Cemented Carbide Dies and your present dies. Our engineers are glad to discuss your needs.

WIRE and BAR DIES ● SIZING DIES
EXTRUDING DIES ● TUBING DIES
Carbide Blanks, Tools, Bits, Reamers, Broaches, Forming Tools

TUNGSTEN ELECTRIC CORPORATION, 564 39th St., Union City, N. J.
Branch Office: 2906 Euclid Ave., Cleveland, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO Pioneers in Tungsten Carbides for over a Quarter Century **CARBIDE DIES**

Outstanding Personalities of the Wire Industry

(Continued from Page 857)

American Steel & Wire Co. Personnel Changes

C. E. Plass has been appointed district engineer in the electrical sales division of the Chicago office of American Steel & Wire Co., subsidiary of U. S. Steel Corp. At the same time, **Victor Siegfried** has been named to succeed Mr. Plass as chief research engineer of the Electrical Cable Works at the company's South Works in Worcester, Mass.

✦ ✦ ✦

MR. Plass has been associated with the Wire Company since 1937, following his graduation from the University of Nebraska, when he was made a laboratorian at Worcester. He has been research engineer at the Cable Works since 1941.

✦ ✦ ✦

A GRADUATE of Leland Stanford University, Mr. Siegfried has been an instructor in electrical engineering at Worcester Polytechnic Institute since 1933.

✦ ✦ ✦

Harry A. Marvin

Harry A. Marvin, of St. John, N. B., long identified with the wire and nail industry, died at St. John, October 8. He had been ill for two weeks. He was the fifth generation of his famliy to participate in wire and nail manufacturing. He was born at Chicago, 64 years ago, the son of the late Frederick E. and Linda Marvin. His father had been active in wire and nail production in Chicago, and the family moved to St. John when H. A. Marvin was in his early boyhood. He went to the St. John schools, and on completing his school education went into the wire and nail business at St. John.

✦ ✦ ✦

FOR many years, he was president and manager of the Maritime Nail Company, and later in the same dual capacity and also president with the Canada Nail & Wire Company, the first with plant in the north end, and the latter with factory in the west end. Distribution of the wire and nails was made through most of Canada.

✦ ✦ ✦

Magrath Heads Riehle's Chicago District Sales

Joseph G. Magrath has been appointed manager of its Chicago district sales territory according to an announcement issued by American Machine and Metals, Inc., East Moline, Illinois.

✦ ✦ ✦

SINCE attending Drexel Institute of Technology, where he studied mechanical engineering, Mr. Magrath has been engaged in various industrial and engineering capacities as sales engineer, sales manager, product sales manager and merchandising manager. He is a member of the Society of American Military Engineers, the American Society for Metals and the American Welding Society.

SATISFACTION PLUS

. . . . In Spools and Reels

You know what *application* experience can mean to the success of your own product. One of the big reasons for widespread acceptance of Hubbard spools and reels in wire mills is the way they are thoroughly engineered to meet the exact specifications of the job.

Whether you use Hubbard welded steel or steel-tired wooden spools and reels, this source of satisfaction can make your own job easier. In addition, it adds value to your own product.

Get the facts about Hubbard products as they apply to your operations. It will pay to write today.

HUBBARD SPOOL COMPANY

1624 CARROLL AVENUE | CHICAGO 12, ILLINOIS

Since 1912, manufacturers of wire drawing and annealing, and shipping spools and reels.

PLANTS AT CHICAGO, ILLINOIS AND GARRETT, INDIANA

Wickwire Spencer's Purchasing Department Moves to Buffalo

WORD has been received that from October 9th the Wickwire Spencer Steel Company's Purchasing Department will be located at River Road, Buffalo, New York. The Department was previously located in New York City.

✦ ✦ ✦

IN the future all purchases and procurements for Wickwire Spencer and the Company's subsidiaries, American Wire Fabrics Corporation, Wickwire Spencer Aviation Corporation and Wickwire Spencer Metallurgical Corporation will be handled through Buffalo. The new offices will be located adjacent to the Company's large Buffalo plant.

✦ ✦ ✦

Booklet On Polyethylene Resins

IN response to the demand for factual data about Polyethylene resins and plastics, the **Plastics Division, Carbide and Carbon Chemicals Corporation,** 30 East 42nd Street, New York 17, N. Y., has just published a 12-page booklet on these interesting new materials. Entitled, "Polyethylene Resins," the brochure describes the forms, properties, fabrication procedures, and uses of this new group of thermoplastic materials.

✦ ✦ ✦

INTERESTING data tables are included which present graphic summaries of the plasticity, electrical properties, and thermal expansion of this latest resin. All available information which has been gathered to date is presented in "Polyethylene Resins." Copies of the booklet are available to engineers, chemists, and executives upon request, and it is hoped that our readers will find this to be of interest.

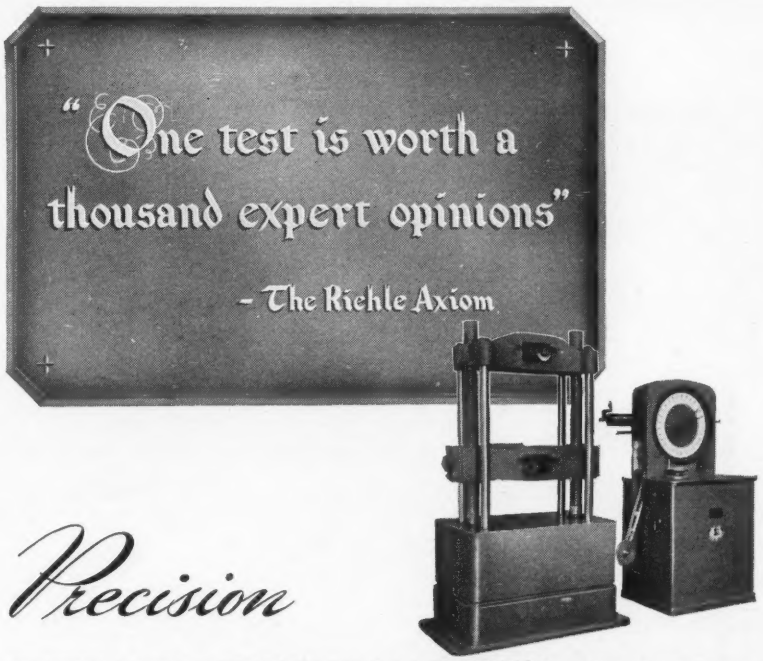
✦ ✦ ✦

Catalog On Cable Swagers

A NEW bulletin entitled "Catalog Section CS," covering a line of new cable swaging machines manufactured by **Standard Machinery Company,** Providence 7, R. I., has been published. This gives illustrations of the machine, close-ups of the dies in position to receive the fitting and the dies in swaging position, individual parts comprising the mechanism, examples of shank type fittings as swaged on cable, tables of capacities and horsepower required for different models and tabulation of steps by which the regular cable swager may be converted into an automatic die opening and feeding machine. Copies of this bulletin may be had upon request to the Company.

Wickwire Spencer's Springs and Automotive Divs. Move to Worcester, Mass.

THE **Wickwire Spencer Steel Company** announced recently that the General Sales Offices of the Springs and Formed Wire Division and of the Automotive Division will be located at New Bond Street. Worcester, Massachusetts. The Morgan plant, where the products of these divisions are manufactured, is also located at Worcester. A District Sales Office of these divisions will continue to be maintained at 500 Fifth Avenue. New York 18, New York.



Precision

HYDRAULIC TESTING MACHINES

Pendulum load indication is more accurate and dependable because it operates on the natural laws of gravitation. This principle of operation is not affected by temperature changes or subject to metal fatigue. .

. . . . have repeatedly demonstrated the practical truth in the words, "One Test is Worth a Thousand Expert Opinions." Because they have simplified the science of testing the physical properties of materials they are widely used throughout the wartime industries today. Here Riehle Testing Machines "ferret out" material weaknesses and defects; avoid failures before they occur. This technique of progressive testing on the production line and in research laboratories saves valuable machine and man-hours. Write for descriptive literature and quotations.

ARMY E NAVY

RIEHLE *HYDRAULIC TESTING MACHINES*

Riehle Testing Machine Division, American Machine and Metals, Inc.

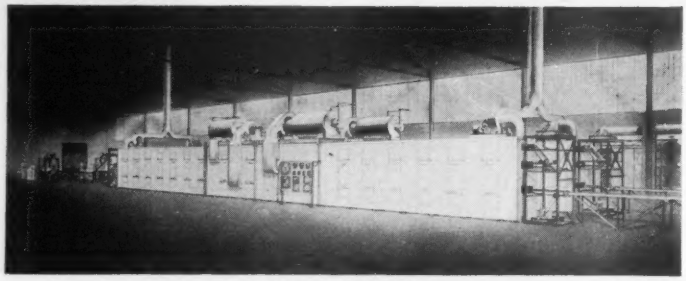
EAST MOLINE, ILLINOIS

Other Products: IMPACT TESTERS ◆ VICKERS HARDNESS MACHINES
BRINELL HARDNESS TESTERS ◆ MEASURING INSTRUMENTS

MORE PRODUCTION IN LESS TIME with CARL-MAYER FURNACES, OVENS

CARL-MAYER HI-SPEED
ROD BAKER

The fastest rod baker built! Saves up to 50% in time and fuel. Patented Blow-Off Feature removes moisture without bumping or agitating the coils. **Patented and patents pending.**



WELDING ROD OVEN

For drying coated welding rods. Uses the "Mayer" Recirculating Gas Fired Air Heater principle and Rod Transfer Systems (patents pending).

Growing interest in our type of equipment is evidenced by Carl-Mayer installations in such plants as:—

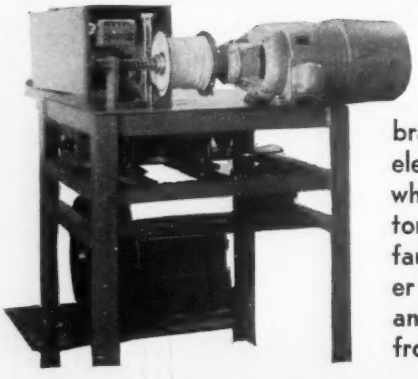
Atlantic Wire Co.
Atlas Tack Corp.
Atlas Steel Co.
Eaton Mfg. Co.
Hollup Corp.
Johnson & Nephew Ltd.
Page Steel & Wire Co.
Pittsburgh Tool Steel Wire Co.
Steel Co. of Canada
Wickwire Spencer Steel Co.

WRITE FOR BULLETIN #241

THE CARL-MAYER CORPORATION 3030 EUCLID AVENUE CLEVELAND, OHIO

SPARKER for SPOOLING SMALL WIRES

THIS APPARATUS WILL AUTOMATICALLY STOP WHEN DIELECTRIC FAULT OCCURS, or when the machine has wound a predetermined length of wire.



It is equipped with a gear head motor, electrical brakes on take-up and pay-off, electrode, control apparatus which automatically reduces the torque of the motor in starting, fault light indicator, transformer with tap switch, volt meter, and variac. Range of voltage from 1,000 to 16,000 volts.

Please Address Inquiries To:

R. L. DAVIS ELECTRIC CO., INC.

WALLINGFORD, CONN.

Government Wire Production Information

(Continued from Page 852)

THE outstanding feature of the vitrified bonded diamond wheel, and also a vitrified bonded diamond hand hone, is the combination of a fast cutting action with extremely long life. In one plant, for example, a Norton vitrified bonded chip breaker wheel ground 2404 tools with $\frac{1}{8}$" wear compared to 1350 tools with $\frac{1}{4}$" wear for a resinoid bonded diamond wheel.

✦ ✦ ✦

IN another plant a similar wheel showed a faster cutting action than resinoid bonded diamond wheels and no appreciable corner wear after grinding 200 chip breakers. In fact it is this ability of the Norton vitrified bonded diamond wheel to hold a sharp corner and postpone the development of radii much longer than resinoid bonded wheels that makes it so advantageous for chip breaker grinding.

✦ ✦ ✦

ANOTHER important advantage is the ability of the vitrified bonded diamond wheel to grind shank steel with little tendency to glaze or load. This characteristic is especially valuable where a relatively large area of steel must be ground with the carbide tip as in the case of cutter blades.

✦ ✦ ✦

VITRIFIED bonded diamond hand hones and 4" and 6" diameter chip breaker wheels are available now. Large scale production of the popular 6x$\frac{3}{4}$" cup and other sizes of vitrified bonded diamond wheels will start early in 1945.

✦ ✦ ✦

George P. Nelson, Director of Engineering, L. A. Young Spring & Wire Corp.

George P. Nelson has returned as director of engineering for L. A. Young Spring & Wire Corp., Detroit, after two years as factory manager for Precision Spring Co., Detroit.

Versatility of Plastics in the Wire Industry

(Continued from Page 855)

adopted for their fixture connectors. For clarity of procedure in wiring, replacements, and trouble shooting, the fixture enveloping the "hot" or current-carrying wires is molded of VINYLITE red plastic, while the grounding wires carry a white plastic connector.

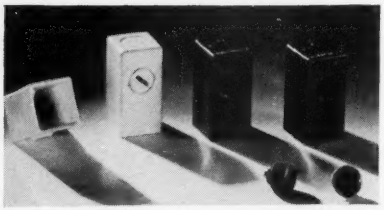


Figure 2. Red Hot—Ground White. ✦

Fixture connectors must secure connections, and the Sherman Company's positive setscrew secures them well and solidly, while the color code prevents possible accidents and facilitates repairs. VINYLITE plastics were chosen for these connectors because of their non-flammability, high tensile strength, moisture resistance, and electrical resistivity. Their insulating qualities insure the safety of the connection. Credit to: Detroit Macoid Company as the molder.

✦ ✦ ✦

Tell 'Em By Tabs

THE tab-type wire marker is another of the new VINYLITE plastic applications that will

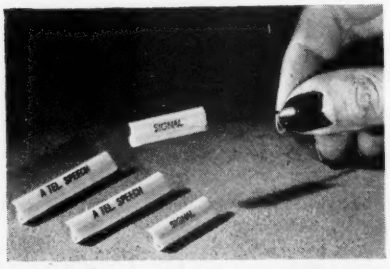


Figure 3. Tell 'em by Tabs. ✦ ✦

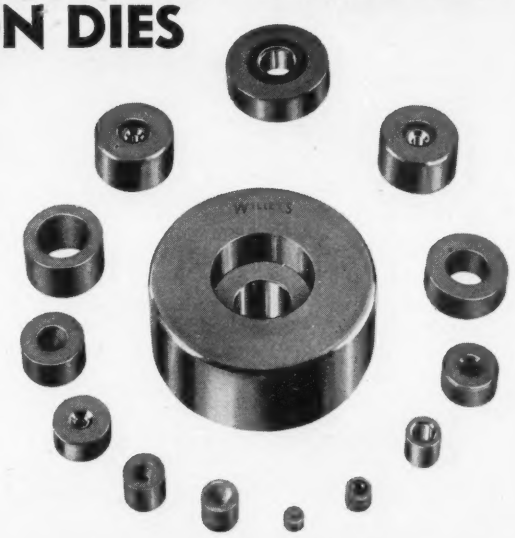
help to simplify the electrician's task in the tracing of specific wires. This new wire marker consists of a sleeve, or tube, which fits around the wire itself; and an apron, or tab, on which is printed whatever designation the wire is

(Please turn to Page 862)

WILLEY'S DIES LAST MUCH LONGER

WIRE DRAWING, SIZING and EXTRUSION DIES

Manufactured in all sizes, to meet your requirements, from a specially developed grade of Tungsten Carbide having freedom from porosity, exceptional abrasion resistance and the ability to take a polish equal to that of diamonds. Furnished in four classifications, (1) blank and rough cored nibs, (2) rough cored dies, (cased), (3) semi-finished, rough drilled dies, (cased), (4) finished dies, ready to use.



WRITE FOR CATALOG

WILLEY'S CARBIDE TOOL CO.
SOLE MAKERS OF WILLEY'S METAL
1342 W. Vernor Highway Detroit 1, Michigan

STATEMENT OF OWNERSHIP, management, circulation, etc., required by the Acts of Congress of August 24, 1912 and March 3, 1933, of Wire & Wire Products published monthly at Washington, N. J., for October 1, 1944.

State of Connecticut, County of Fairfield, ss.: Before me, a Notary Public in and for the State and county aforesaid, personally appeared Richard E. Brown, who, having been duly sworn according to law, deposes and says that he is the President of Wire & Wire Products and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Quinn-Brown Publishing Corporation, 300 Main St., Stamford, Conn.; editor, Richard E. Brown, 300 Main St., Stamford, Conn.; managing editor, none; business manager, Richard E. Brown, 300 Main St., Stamford, Conn.

2. That the owner is: (if owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Quinn-Brown Publishing Corporation, 300 Main St., Stamford, Conn.; Richard E. Brown, 300 Main St., Stamford, Conn., and Leta B. Brown, of Montecito, California.

3. That the known bondholders, mortgagees, and other security holders owning or holding one per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none so state.) None.

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Sworn to and subscribed before me this 2nd day of October, 1944.

(SEAL) JAMES A. WEIR,
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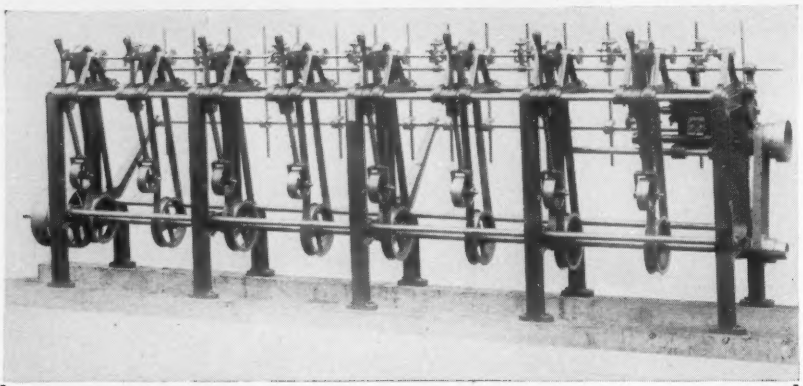
My commission expires April 1, 1947.



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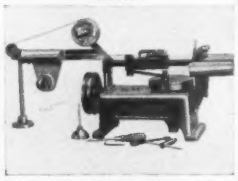

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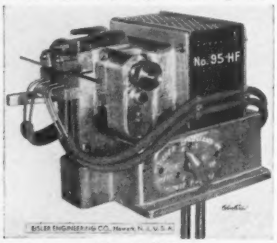

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(Continued from Page 861)

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✦ ✦ ✦

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✦ ✦ ✦

THESE proposed standards cover the stages in the manufacture of insulated conductors, multiple conductor cords and cables at which spark-tests should be applied. The conditions governing the selection of the "maintained" or "momentary" fault signal systems are outlined. Spark-testing voltages are recommended for different wall thicknesses of various rubber and synthetic-resin compounds.

✦ ✦ ✦

THE required sparker characteristics are given, including voltage indication and adjustment, sparker capacity, fault circuit sensitivity and speed. The proper design of the electrode and electrode length for different wire speeds are standardized. The use of a sparker-testing unit is definitely recommended for periodic checks by inspectors to insure that all sparkers comply with the requirements of sparker-circuit sensitivity, speed of fault detection circuit and correct visual voltage indication.

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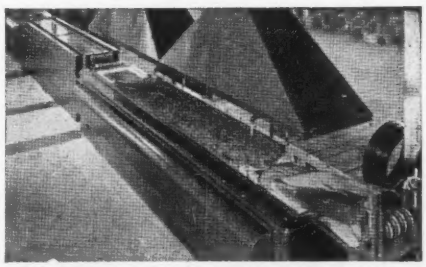

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Wire in Combat

(Continued from Page 847)

PEOPLE have asked me what was the most impressive sight of the war, and I answer freely that it was that night, when just about dusk, all of the assembled ships of the vast armada in the Bay of Algiers were firing their anti-aircraft guns simultaneously at enemy planes. They were joined by the British battle fleet. The sky was criss-crossed with tracer shells, and was one big streak of light. This was indeed tremendous when you think of the fact that only every 3rd or 5th shell is a tracer.

✦ ✦ ✦

AFTER unloading the "SAMUEL CHASE," we proceeded to Gibraltar, and in a small convoy left there for the British Isles. The first night out of Gibraltar we were set upon by a wolf pack of submarines and 3 ships were hit in quick succession, one of them apparently very badly because she went down by the bow immediately and her propeller could be seen in the half glow of a parachute flare to be revolving in the air. That was the last we saw of her. There were set off innumerable parachute flares for the purpose of picking up surface submarines, and while looking for them with my binoculars, I was gazing directly astern when, almost in my face, the carrier HMS-AVENGER, blew up with a roar. In the yellowish light airplanes could be seen scattered in the sky. The flight deck broke in two. The entire ship bulged. In a few seconds the light was practically extinguished. There was a pall of black smoke which could even be seen in the darkness, and in less than a minute there was nothing. Everyone on the ship was shaken in view of the fact that it was obvious all personnel on the carrier had been incinerated.

✦ ✦ ✦

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ever, we took on board British troops who were sorely needed in North Africa and landed them at Algiers. At the latter place many of the American troops whom we had landed in November, including some officers, rushed back to greet their old pals, and, incidentally, to get a bath. The Colonel of the troops, a very friendly person, came aboard and stated that any ship which on her own so successfully fought off the enemy for three days alone, deserved the designation of "Lucky Chase," and that was particularly true since we were the only American ship to come through.

✦ ✦ ✦

ON the next return to North Africa, the "SAMUEL CHASE" was designated as the training ship for the Navy and for the Army, and day by day we would hoist and lower our boats to train the Americans, and also the French. The boats would come up and go down with almost clock-like precision. The wires frayed, but they never broke. All the more noteworthy because of the fact that they had been subjected to many abuses and much shock. And, incidentally, periods of training are not easy, either. At 2 o'clock in the morning we would start our night exercises. They would be completed at about 9. And in the afternoon we would start all over again on the day exercises. But I believe that this period of training was justified in view of the result at Sicily.

✦ ✦ ✦

AS you know, my friends, between the time of Pearl Harbor and the invasion of Sicily, there had occurred in the United States an industrial revolution. From all sorts of cities and factories through the Middle West, particularly, there are made the many things which go into LSTs. Many of these LSTs were assembled in the yards right here at Pittsburgh, and, by the time of the Sicilian invasion, were in service. Therefore, this industrial re-

(Please turn to Page 869)

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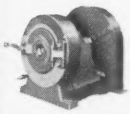

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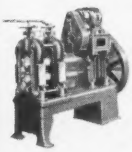

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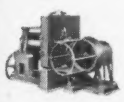

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Design Considerations for Square or Rectangular Wire Helical Springs

(Continued from Page 844)

Stress in Rectangular Wire Springs, Curvature Effects Included

AN exact calculation of stress in rectangular wire springs is very complicated if account is taken of the effect of bar curvature in increasing the stress. This is particularly true if the spring is coiled flatwise as in Fig. 6. However, the following approximate formulas may be applied for most purposes. Where the long side of the cross-section is parallel to the spring axis as in Fig. 2 and where b/a is between unity and 2.5, an approximate expression for the peak stress including curvature is:

$$\tau_{max} = K^1\left(\frac{Pr(3b + 1.8a)}{b^2a^2}\right) \quad (11)$$

where K^1 is obtained from Equation 6 or the curve of Fig. 4 using $c = 2\,r/a$. Where b/a is between 2.5 and 3 this equation will give results accurate to within a few per cent for indexes $c>4$; where c is between 3 and 4 the error may be as much as 7%. For more accurate results the chart of p. 214, reference (4) may be used.

\+ \+ \+

WHERE the long side of the rectangle is parallel to the spring axis (Fig. 2) and $b>3\,a$, an approximate expression for stress including curvature is (5)

$$\tau_{max} = \frac{3}{2}\,\frac{P(2r + a)}{a^2(b - .63a)} \quad (12)$$

\+ \+ \+

WHERE the spring is coiled flatwise (Fig. 6) the calculation of peak stress with curvature considered becomes complicated. Normally the peak stress in a straight rectangular bar under torsion is at the mid-points of the long sides of the rectangle. This will also be true where the bar is coiled in the form of a spring of large index. However,

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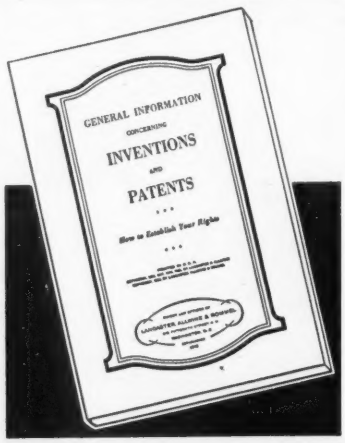

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for smaller indexes the effect of curvature is to cause an increase in stress at the inside of the coil or along a short side of the section.

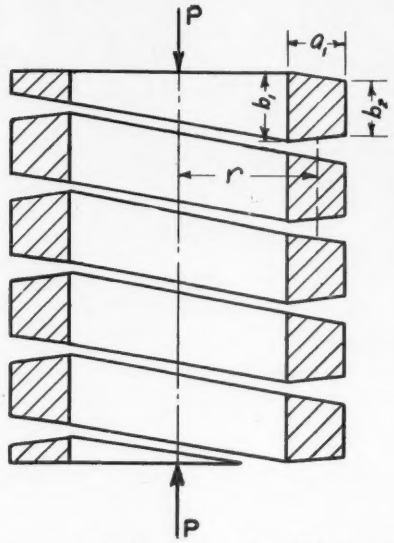

Fig. 5. Trapezodial Shape is Assumed By Square Wire After Coiling.

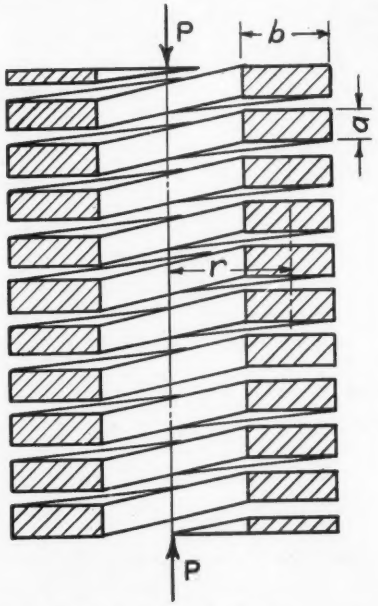

Fig. 6. Helical Spring Coiled Flatwise.

Thus two opposing effects come into play and hence the peak stress (Fig. 6) may occur either on the short or on the long sides depending on the spring index and the ratio b/a.

✦ ✦ ✦

FOR calculating such cases, the charts given in reference (4) page 214 which include curvature effects may be used. However, for static or infrequently repeated loads, as discussed later, the effect of curvature may usually be neglected and Equation 2 may be used for design purposes.

✦ ✦ ✦

Application of Formulas to Static or Fatigue Loading

THE stress formulas given in this paper with curvature included will yield the stress range in the spring, which is of primary interest where fatigue or repeated loading is involved. Because of cold-setting operations usually carried out on springs, with resulting plastic flow, the stress formulas based on elastic conditions will not necessarily yield the peak stress.

✦ ✦ ✦

WHERE static loads, or loads repeated only a few times are involved, calculation of stress

(Please turn to Page 868)

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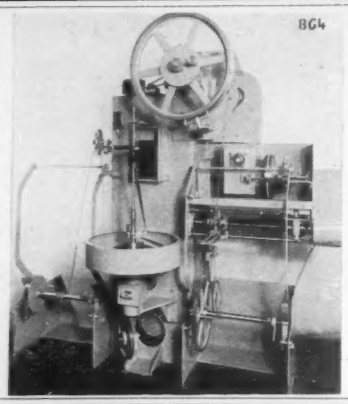

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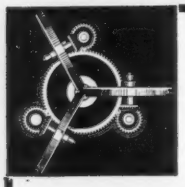

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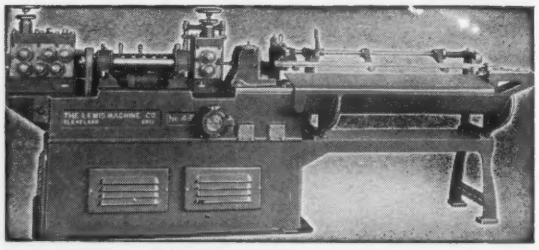

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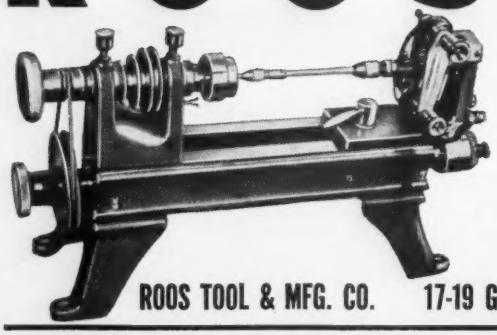

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Design Considerations for Wire Helical Springs

(Continued from Page 867)

by neglecting curvature effects (Equations 2 or 4) appears justified. This is in line with usual design practice where stress concentration effects are neglected for static loading.

✦ ✦ ✦

IT is of interest to note that if yielding at constant stress is assumed, in the case of torsion of a square wire cross-section, complete yielding over the cross-section will not occur until the load has increased to 1.6 times the value where yielding starts, calculated from Equation 4. (See reference 6). In the case of a round wire section, this ratio is only 1.33. Since for a given wire or bar size the elastic stress in a square wire section is about 6% lower than for the round wire of the same nominal size, the net result is that for complete yielding at the same stress the square wire spring will carry about 27% more load than the corresponding round wire spring. Assuming that the quality of the material is equally good whether made in a round or square section, this would appear to indicate that the use of square or rectangular-bar section springs should be considered where maximum utilization of available space is of paramount importance.

✦ ✦ ✦

REFERENCES

(1) "New Spring Formulas and New Materials in Precision Spring Scale Design" by M. F. Sayre and A. V. deForest, presented at annual A.S.M.E. meeting, Dec. 1934.

(2) See "Theory of Elasticity" by Timoshenko, p. 239, (McGraw-Hill, 1934) for a more complete discussion of the membrane analogy. Also "Mechanical Springs", by the author, page 203. (Penton)

(3) "Die Berechnung Zylindrischer Schraubenfedern" by O. Göhner, V.D.I. V. 76 p. 269.

(4) "Mechanical Springs", p. 37.

(5) Liesecke, V.D.I. 1933 p. 892.

(6) "Plasticity" by A. Nadai, McGraw-Hill, p. 137.

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Wire in Combat

(Continued from Page 865)

volution brought about a revolution in amphibious warfare. For, in the invasion of North Africa, the operation was carried out solely by large ships carrying small boats on their decks. But in Sicily, and on subsequent invasions, all sorts of specialized equipment had been built by the patriotic men and women back home. As we approach Sicily there were transports, LSTs, LCTs, LCIs, cruisers, etc., which could be seen from our vantage point ahead in an arc of about 150°, dotting the ocean as far as the horizon.

✦ ✦ ✦

TRULY the **might of America** had arrived in the Mediterranean. When night approached, we could see the shores of Sicily, which were lighted by fires caused by bombs. Yes, and we had air coverage, too,—something we did not enjoy in the Algerian operation, and as we approached our beach at night, screaming shells from cruisers and destroyers knocked out gun emplacements and other points of resistance on the beach. The weather was rough at Sicily, but that did not impede our dauntless boys, and with a resoluteness born of battle, they went ahead to do an outstanding job. On the day after our night landing, LSTs loaded with vehicles crammed axle to axle, and with grim-faced men, made for the beach. As they hit, the great doors and ramps would open, and out would stream a line of tanks

(Please turn to Page 870)

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Wire in Combat

(Continued from Page 869)

and vehicles. After the LSTs were unloaded, they would be hauled off the beach by the anchor, which had been dropped on the way in, being fastened by a huge wire cable to the stern. Nowhere is a wire more important, and it might even be said that these 2,000-ton boats hung by a wire. In no case was there a failure of the wire. Wire in combat, indeed!

✦ ✦ ✦

THEN, the "SAMUEL CHASE" was also engaged in the Battle of Salerno. As you people know, the Italians had given up the day before, and the announcement to the troops was greeted with wild cheers. Realistic Army leaders spoke to the men and told them there would be resistance on the beach from the Germans, and there was. The Germans had prepared a reception for us. Mine fields offshore, land mines on the beach, machine gun nests, mortars, obstructions in the water, and, back in the hills, 77mm. and 100 mm. guns covered the entire area. Regardless of this, it was possible for us to land our troops with a modicum of surprise in view of the fact that it was dark and the exact time of our coming was, of course, unknown to the enemy. But after the first waves landed, the fireworks began. You have all read the papers and it is unnecessary for me to tell you of the grim resistance the enemy put up at Salerno. After the troops were off, the ship moved in so close that actually the "SAMUEL CHASE" was reported lost, but there we had a ringside seat for the fortunes of war, and it was possible to see the land maneuvers of the opposing forces distinctly. Our air coverage was even better than at Sicily, and while there were intermittent raids, they did not amount to much except on the last night when the Admiral aboard my ship, it being the flagship, stated we were to proceed slowly to sea.

✦ ✦ ✦

I HAD already ordered a greater speed than that asked for, and

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requested permission to continue it. The Admiral consented, and as we proceeded out through the mine fields, German bombers swarmed over to set off parachute flares, then swarmed back. Bombs literally rained from the sky, and some thousand pounders landed so close they actually sprayed water on the bridge. The shock was so great below the waterline that some men in the engine room thought we were hit. Yet in this night attack not one large American transport was hit; but some of the smaller vessels did not fare so well. Again the Lucky Chase lived up to her reputation.

✦ ✦ ✦

BUT what about our young men who are out there fighting in the Army, the Marine Corps, or the Navy? They never falter, they never doubt. Their nerves must be indeed of strong wire, else I cannot see how they can persist in being so indomitable and constant and courageous!

✦ ✦ ✦

I WANT to give you an example of our youth. In the battle of Ain Taya, east of Algiers, in November, 1942, in the invasion of North Africa, the "SAMUEL CHASE" was set upon by many JU88s. Our untried men did a marvelous job of fighting off the enemy and downed 3 planes. During one of the attacks, I glanced upward to see a boy of 18 firing a 20 mm. at the enemy. Presently he ceased firing and looked upward into the sky. He was smiling. Well, what do you think of him? Indeed, he was a veteran, and what an equipment of wire nerves!!

✦ ✦ ✦

SO I want to leave with the thought that this little scene impressed upon me—that there is an invisible wire running through our young manhood, leading them on. And while we continue to have this strong and steady link transmitting what is finest and best from the past into the present, and beyond into the future, we need have no concern about the welfare of our country.

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Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Gilron Products Co., Cleveland, Ohio.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., New York, N. Y.

DIAMOND POWDERS—
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Fort Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
United Die Co., Newark, N. J.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Fort Wayne Wire Die, Inc., Fort Wayne, Ind.
Hartley Wire Die, Thomaston, Conn.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Hartley Wire Die, Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Hartley Wire Die, Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Hartley Wire Die, Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Hubbard Spool Co. Chicago, Ill.
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING AND PRE-HEATING ROOMS—
Industrial Oven Engr. Co., Cleveland, O.

DRYING EQUIPMENT—
Rockwell, W. S., Co., New York, N. Y.
Ross, J. O., Engr. Corp., New York, N. Y.

ELECTRIC RESISTANCE HEATING—
Trauwood Engr. Company, Cleveland, Ohio

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCES AND FENCING—Wire
Wickwire Spencer Steel Co., New York, N. Y.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Oven Engr. Co., Cleveland, O.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engr. Company, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.

WHERE TO BUY, Continued

Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Electric
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Trauwood Engr. Co., Cleveland, Ohio

FURNACES—Hardening & Tempering
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Trauwood Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, Ohio
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio
Pennsylvania Industrial Engrs., Pittsburgh, Pa.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

GALVANIZING EQUIPMENT—
Wilson, Lee, Engr. Co., Cleveland, Ohio

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

INSULATING MATERIALS — Electric Wire & Cable
Carbide & Carbon Chemical Corp., Plastics Div., New York, N. Y.

INSULATION LACQUERING SYSTEMS—Continuous
Industrial Oven Engr. Co., Cleveland, O.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry & Machine Co., Waterbury, Conn.

LIME
Warner & Company, Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Syncro Machine Co., Rahway, N. J.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Coilers
Broden Construction Co., Cleveland, Ohio
Eisler Engineering Co., Newark 3, N. J. (for Tungsten Wire)
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
American Insulating Mach'y Co., Philadelphia, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Philadelphia, Pa.
Fidelity Machine Co., Philadelphia, Pa.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, Ohio
Eisler Engineering Co., Newark 3, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery Inc., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.

MACHINERY—Draw Benches
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging
Broden Construction Co., Cleveland, Ohio.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Industrial Oven Engineering Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark 3, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming
Eisler Engineering Co., Newark 3, N. J.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Hydraulic Testing
Riehle Testing Machine Div. of American Machine & Metals Inc., East Moline, Ill.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

WHERE TO BUY, Continued

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Nail and Tack
Broden Construction Co., Cleveland, Ohio.
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Quill Winding
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark 3, N. J.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Riehle Testing Machine Div. of American Machine & Metals Inc., East Moline, Ill.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Equipment—Spark ers
Entwistle, Jas. L., Pawtucket, R. I.

MACHINERY—Testing Spring
Riehle Testing Machine Div. of American Machine & Metals Inc., East Moline, Ill.
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark 3, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark 3, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Industrial Oven Engr. Co., Cleveland, O.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark 3, N. J.
Nilson, A. H., Co., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Eisler Engineering Co., Newark 3, N. J.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
New England Butt Co., Providence, R. I.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
Industrial Oven Engr. Co., Cleveland, Ohio
Rockwell, W. S., Co., New York, N. Y.

OVENS—Dehydrogenizing
Industrial Oven Engr. Co., Cleveland, O.
Rockwell, W. S., Co., New York, N. Y.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Oven Engr. Co., Cleveland, Ohio
Rockwell, W. S., Co., New York, N. Y.
Ross, J. O., Engineering Corp., New York, N. Y.

OVENS—Welding Rod Coating
Industrial Oven Engr. Co., Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.
Rockwell, W. S., Co., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING TANK LININGS—
Ceilcote Co., The, Cleveland, O.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio
Keagler Brick Co., Steubenville, Ohio.
Sauereisen Cement Co., Pittsburgh, Pa.

PIPES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lacquer
Industrial Oven Engr. Co., Cleveland, O.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Homer, N. Y.
Magnus Chemical Co., Garwood, N. J.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

WHERE TO BUY, Continued

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Industrial Oven Engr. Co., Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Traverse
Hubbard Spool Co., Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Brewer Mfg. Co., Muncy, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

SATURATION SYSTEMS—
Industrial Oven Engr. Co., Cleveland, O.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Oven Engr. Co., Cleveland, O.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPRINGS—Steel
Wickwire Spencer Steel Co., New York, N. Y.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRAND—Steel and Copper
Brewer Mfg. Co., Muncy, Pa.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

STRIP METAL TESTERS—
Riehle Testing Machine Div. of American Machine & Metals Inc., East Moline, Ill.
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANK LININGS—Brick
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.
Nukem Products Corp., Buffalo, N. Y.

TANKS—Pickling
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Nukem Products Corp., Buffalo, N. Y.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Riehle Testing Machine Div. of American Machine & Metals Inc., East Moline, Ill.
Scott, Henry L., Co., Providence, R. I.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark 3, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio

WIND-UP AND UNWIND SYSTEMS—Continuous
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Oven Engr. Co., Cleveland, O.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Corp., Youngstown, Ohio.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled for Coils
North American Philips Corp., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Spencer Steel Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Music
Jersey Steel & Wire Corp., Irvington, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.

WIRE—Non-Ferrous to Specification for Special Purposes
Hudson Wire Co., Ossining, N. Y.
North American Philips Corp., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Spencer Steel Co., New York, N. Y.

WIRE—Stainless Steel
Firth-Sterling Steel Co., McKeesport, Pa.
Jersey Steel & Wire Corp., Irvington 11, N. J.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Spencer Steel Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Riehle Testing Machine Div. of American Machine & Metals Inc., East Moline, Ill.
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

YARNS—
Cheney Bros., New York, N. Y.

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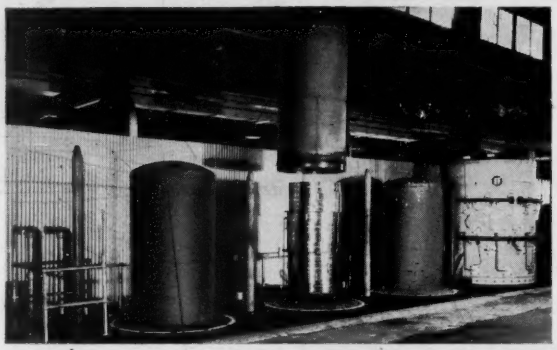
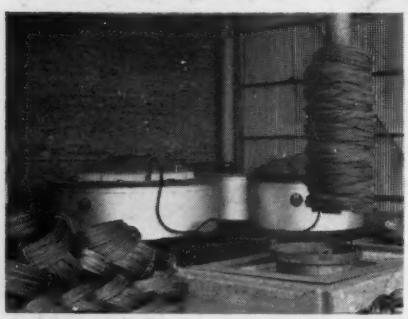
Gas Fired, Oil Fired or Electric Furnaces — For Any Product or Production

Bright Annealing Copper Wire EF combination gas-electric furnace bright annealing copper wire. Handles strip, wire and rod in coils as well as wire on spools and reels.



Bright Annealing Strip, Wire, Etc. EF bell type furnaces maintain uniform temperature distribution throughout the material regardless of the size, weight or height of the charge.

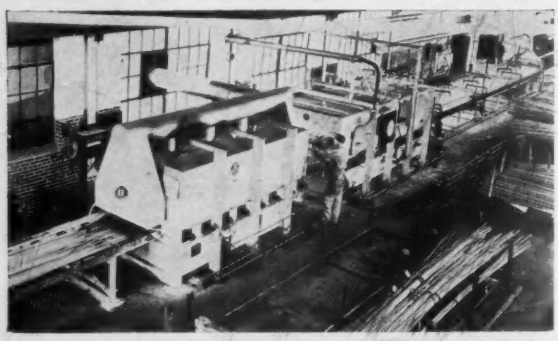


Normalizing and Annealing Rod EF circular pits efficient furnaces with excellent temperature distribution. Also used for bright annealing wire, and other products.

ELECTRIC AND FUEL FIRED EF FURNACES

We build the furnace to fit the job

EF Convection Pits Fans in motor operated covers force atmosphere down between baffles and heating elements and the heat uniformly up through material.



Bright Annealing Tubing An EF combination gas-electric furnace bright annealing 2000 lbs. high carbon alloy seamless steel tubing per hr. without decarburization. Other sizes and types for handling any length or size of ferrous or non-ferrous tubing and for any production required.

Scale-Free Hardening Small Parts Bolts, springs, gears, bearing parts, etc. are hardened uniformly and continuously in EF chain belt furnaces similar to the above. Built in sizes to handle from 175 to 2000 lbs. per hr.—electric or fuel fired.

Additional data on these and other types of EF production furnaces sent on request.

The Electric Furnace Co., Salem, Ohio

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